INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

RARY
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THE SHOP TEACHERS'
PROFESSIONAL
MAGAZINE

SEPTEMBER, 1943

VOL. 32, No. 7

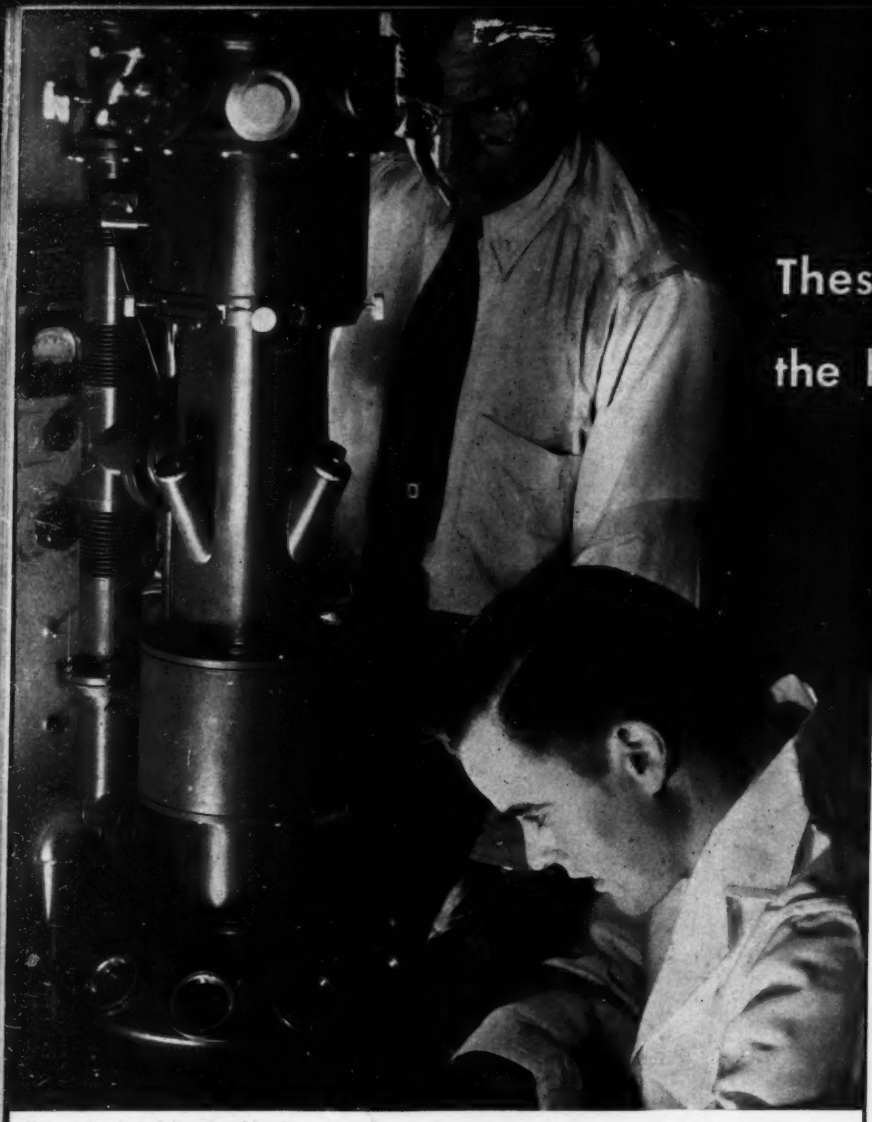

Photo courtesy Radio Corporation of America

These men look deeply into the heart of the commonplace

...AND DISCOVER MIRACLES

From materials known to man for thousands of years science is now achieving its modern miracles . . . all because it had the wit and the means to discover the true nature of what is called the commonplace.

● Vice-president Henry Wallace has called this the Century of the Common Man. Perhaps in view of the surprising and even marvelous drugs, chemicals and synthetics that science is producing from things as humble as coal, air and water this should also be called the Century of the Common Material. For men at last are learning to look deep into the heart of the commonplace and discover the miracles that are there.

As it is with materials, so it is with men. Just as all elements have their parentage in a universal substance, requiring only the proper handling to produce "miracles" so all human beings possess the fundamentals which can be turned into achievement and success.

The educator who has a sense of his true responsibility recognizes this and constantly seeks to set fire to the imagination of the lads in his charge . . . to foster the vision and inculcate the habit that translates ideas into immediate and directed action, so that they experience early the unique and never-to-be-forgotten thrill of achievement.

Probably one of the greatest opportunities to kindle the flame of desire first arises when a boy enters a mechanical drafting class. For here the world of his future manhood reaches out and touches his own world. Here he can begin that discipline which leads to the firmly fixed *habit* of achievement. Here, if the drawing instruments he uses are chosen with care, they can spur his imagination, kindle his enthusiasm, lift his horizons, break the trail which will lead to success. That is why competent drafting instructors urge the best set of drawing instruments each boy can afford. Such *better* instruments are an investment repaid many times in *any* more fruitful career.

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● The demand for Dietzgen Drawing Instruments today greatly exceeds the present available supply. First, the national wartime requirements are making a tremendous demand on our production capacity. Second, the critical materials used in making Dietzgen quality instruments impose a drastic limitation on production for other than the needs of our armed forces and essential war production. Your tolerant understanding of this situation is appreciated.

DIETZGEN

EVERYTHING FOR DRAFTING AND SURVEYING

The Flying Lathes of the Air Corps

One of the toughest jobs of the Air Corps Technical Service is to get disabled planes back into the air when they have been forced down in remote locations. No matter where the plane is grounded, skilled technicians must get there quickly with all the tools and equipment required to make emergency repairs.

Buy War Bonds!

Precision machine operations are sometimes required—so the Air Corps is prepared to fly a Precision Lathe wherever a plane can land. Packed in special, lightweight cases and fitted with accessories for doing a variety of work that would surprise you, these flying lathes are an important part of the Air Corps' emergency service equipment.

We are proud that South Bend Lathes have been selected for this important service—one of many vital assignments that are keeping South Bend Lathes busy for the duration.

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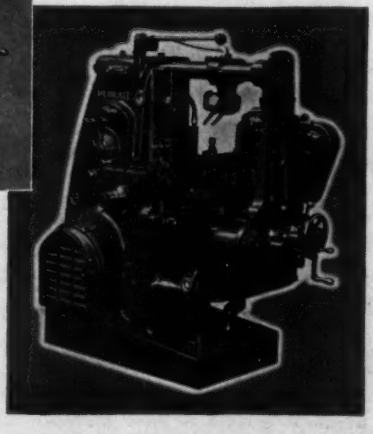
SOUTH BEND, INDIANA LATHE BUILDERS FOR 36 YEARS

FEATURES THAT MAKE THE "*Milwaukee*" IDEAL FOR TECHNICAL INSTRUCTION

- ☆ **SAFETY** centralized controls with built-in safety interlocks make it impossible to engage power controls when hand controls are in use.
- ☆ **MODERN DESIGN** many features of advanced design usually found only in larger machines facilitate instruction that is up-to-date.
- ☆ **QUALITY CONSTRUCTION** double overarms, full-back column and other Milwaukee features provide stamina to withstand the handling of inexperienced operators.
- ☆ **LOW HEIGHT** adapts the machines to students; compact design provides easy reach and accessibility.
- ☆ **FINGER-TOUCH CONTROLS** centralized and within easy reach, require minimum manual effort.
- ☆ **INDUSTRIAL ACCEPTANCE** widely used in industry, Milwaukee milling machines will be familiar tools to the student when he takes a job.

Model 2-HL, Plain Type

Compact, complete—with all tried and tested features usually found only in larger machines . . . low in height . . . minimum floor space . . . full back column . . . centralized controls.



Model 2-HL, Universal Type

he performance — accuracy of & T Milwaukee Milling Maines is noted throughout the dustry. Finger-touch safety conols . . . the famous K & T Double verarms . . . directional feed vers . . . plus other perfected atures.

Milwaukee milling machines possess an unusual number of features of great value and appeal to the technical instructor. Engineering colleges, technical and vocational schools in the United States and abroad find Milwaukee exceptionally well adapted to classroom work.

For the best instruction in current milling machine technique, modern equipment is essential. Outmoded and obsolete machines are increasingly being replaced with Milwaukees because they embody the maximum of advanced as well as time-tested features of design and construction.

Kearney & Trecker Corporation has always maintained close relations with technical educators and institutions and invites correspondence on all milling machine and machine tool subjects.

Milwaukee MACHINE

AIDS TO TECHNICAL INSTRUCTORS IN TEACHING THE "KNOW-HOW" OF MILLING MACHINE OPERATIONS

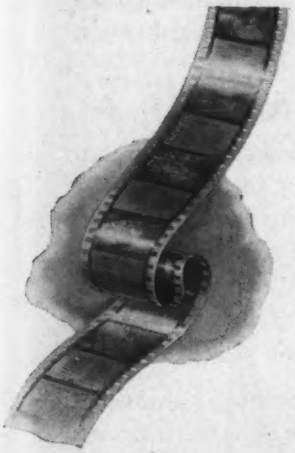
The material described below is indicative of the comprehensive service we offer to technical instructors and institutions in the interest of keeping abreast of modern milling machine practice and design:

ILLUSTRATED HANDBOOK ON THE FUNDAMENTALS OF MILLING

Every vocational instructor can use to advantage the newest Kearney & Trecker publication, "The Right and Wrong of Milling Practice." Written in an easy-to-understand style — contains hundreds of illustrations depicting the right and wrong way of operating a milling machine — plus many valuable suggestions on short cuts in milling — the correct care and attention of the machine.

Even experienced milling machine operators find this handbook useful and valuable in brushing up on the fundamentals of sound milling practice. Industrial arts educators and men in charge of apprentice training regard it as a practical, condensed textbook on milling practice.

Write for your personal copy and full information as to how you can secure additional copies for distribution to students.



MILLING PRACTICE—VISUAL TRAINING COURSE

The Visual Training Program consisting of five sound-slide films dealing with the fundamentals of milling practice, continues to prove highly popular with vocational instructors and industrialists everywhere. Interestingly arranged, the films show many types of operations such as T-slotting, angular and straddle milling, circular milling, dovetailing, boring and end milling.

Many vocational schools report unusually successful results with this visual course. It is available on a rental basis at nominal cost.

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SPEED CHARTS

showing recommended speeds and feeds — catalogs, bulletins, and other literature available to technical educators on request.

Write the Department of Industrial Education, Kearney & Trecker Corporation, for complete information on the above and other material available to engineering colleges, technical and vocational schools. We invite technical educators to keep in touch with us on all subjects concerning milling practice, changes and developments in milling machine design.

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T O O L S

Train Better Welders Faster with these Airco Instruction Books

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Vol. 1, Lectures. Introduces the student to fundamental gas welding methods. It explains the design and operation of welding and cutting torches, tips and regulators and describes properties of various metals as well as practical welding methods used in industry. **Vol. 2, Exercises,** presents a series of carefully planned exercises that help the student to quickly learn practical methods for welding the most commonly used metals. Each volume is bound in a hard cover. Price $1.00 per copy.

ARC WELDING

Vol. 1, Lectures. Acquaints the student with fundamentals of electricity, its application to welding, and the operation of welding machines. **Vol. 2, Exercises** begins with the basic operation of striking an arc and covers welding with all types of electrodes. Standard tests are included to help the instructor determine the student's progress. Bound in a hard cover. Price $1.00 per copy.

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Free inspection privileges are provided for each of the above books. Special discounts to teachers on single copies, and quantity discounts for students. Write to Air Reduction, Advertising Department, 60 East 42nd St., New York.

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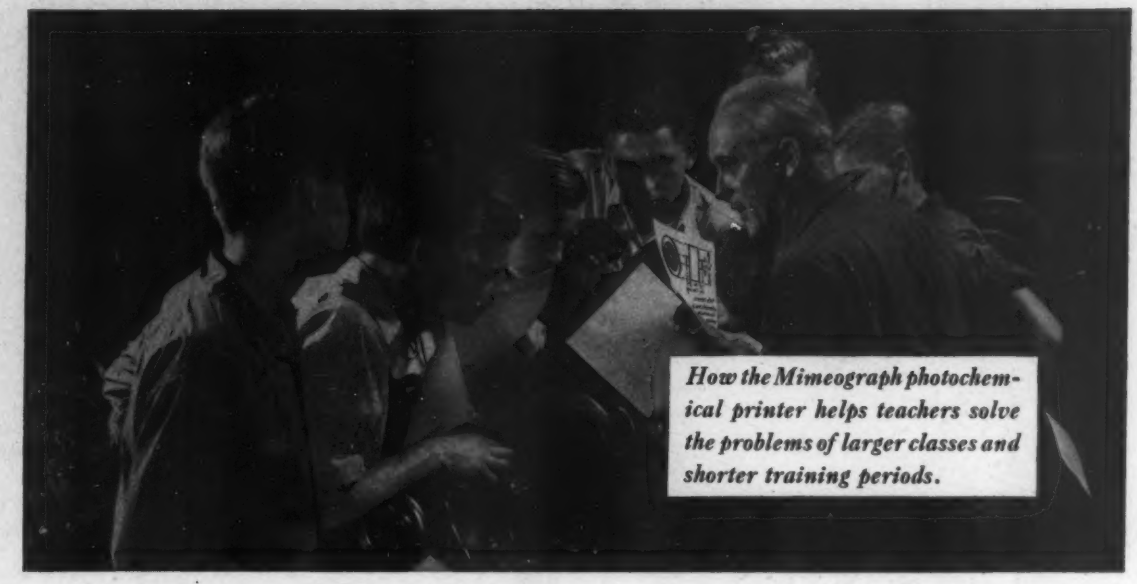
IDLE CYLINDERS ARE PRODUCTION SLACKERS: *Keep 'em rolling for victory!*

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, September, 1943, Volume 32, No. 7. Published monthly, except during July and August, by The Bruce Publishing Co., Milwaukee 1, Wis. Entered January 2, 1914, as Second-Class matter at Milwaukee 1, Wis., under Act of March 3, 1879. Subscriptions — U. S., $2.50 per year. Canada and Foreign, $3.00. Single copies, 35 cents.

More students . . . fewer teachers



How the Mimeograph photochemical printer helps teachers solve the problems of larger classes and shorter training periods.

Today industrial arts teachers need every efficiency help they can get. Because of the serious shortage of certified teachers, those remaining are working longer hours, taking on greater loads than ever before.

More and more schools are turning to the Mimeograph photochemical printer to help lighten the teaching burden and to maintain efficiency standards.

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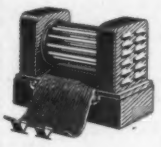

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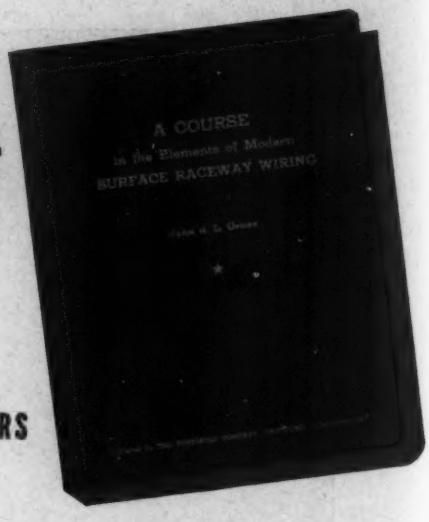

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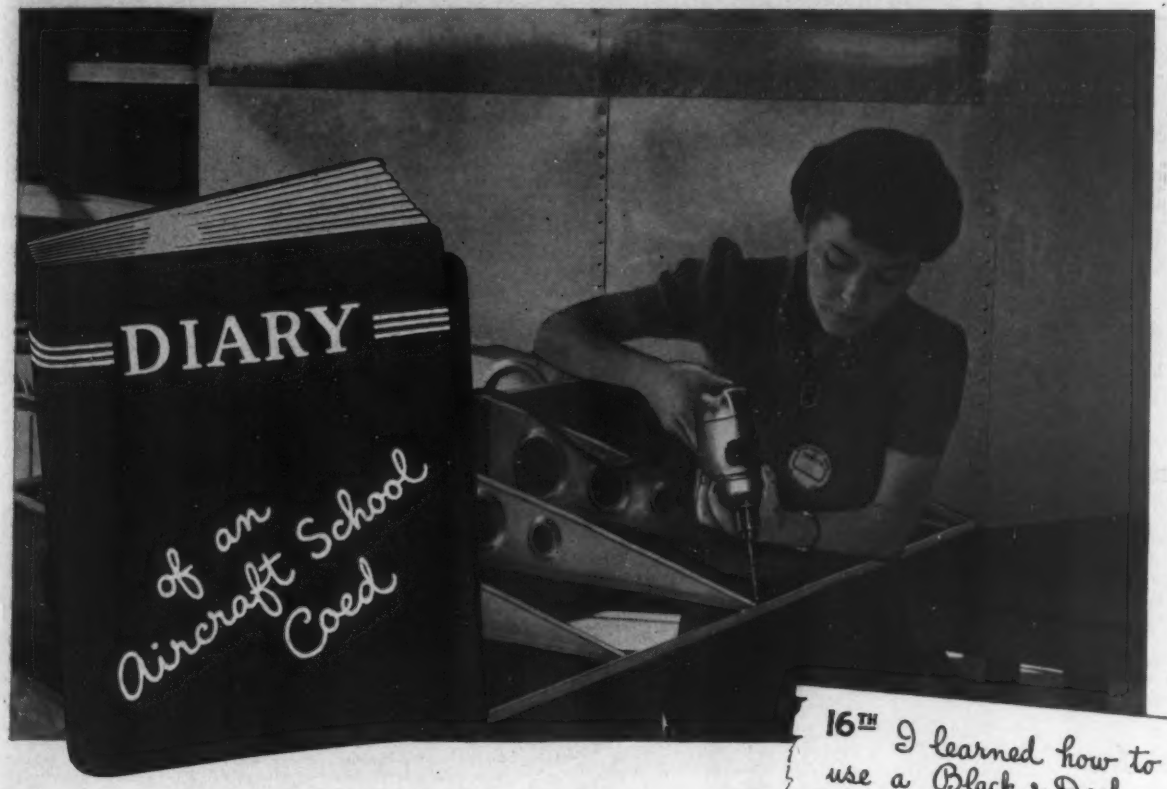

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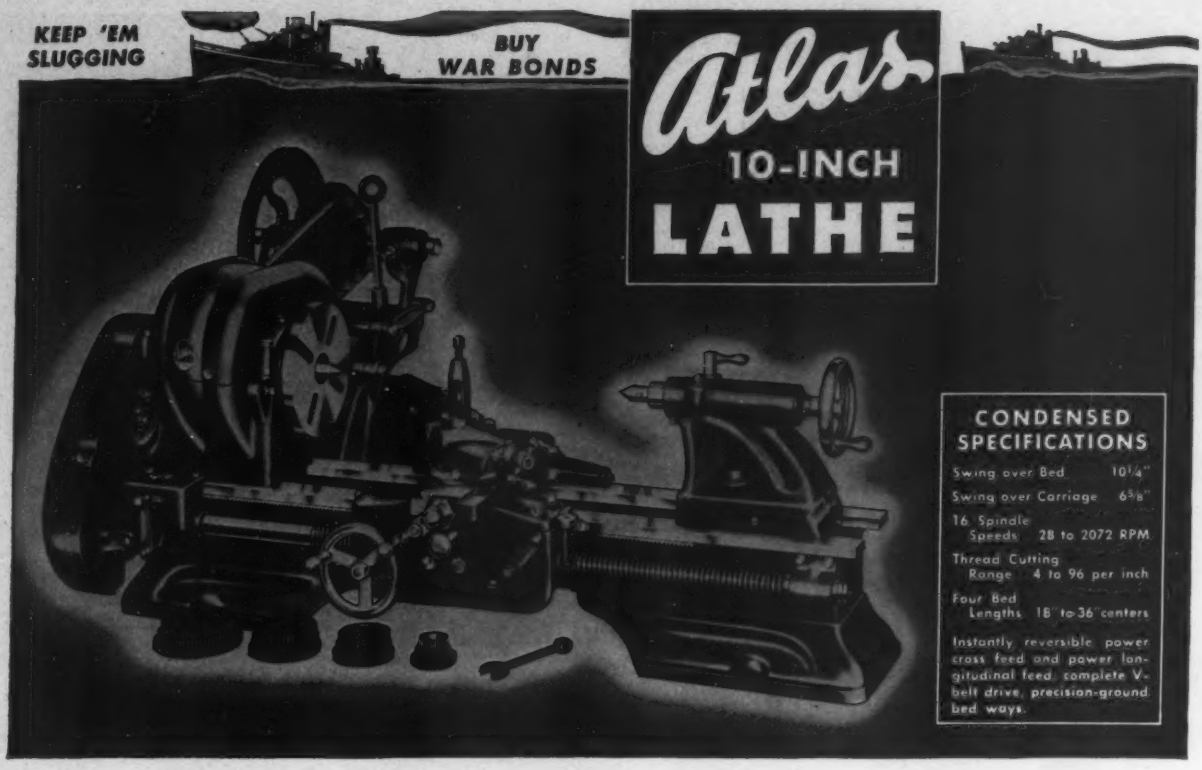
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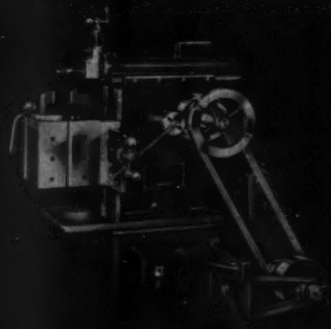

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No. 10 "YANKEE" RATCHET SCREW DRIVER
No. 15 "YANKEE" RATCHET SCREW DRIVER
No. 1545 "YANKEE" RATCHET HAND DRILL
No. 990 "YANKEE" VISE

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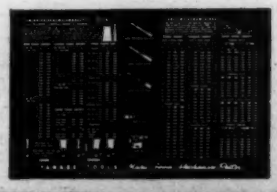

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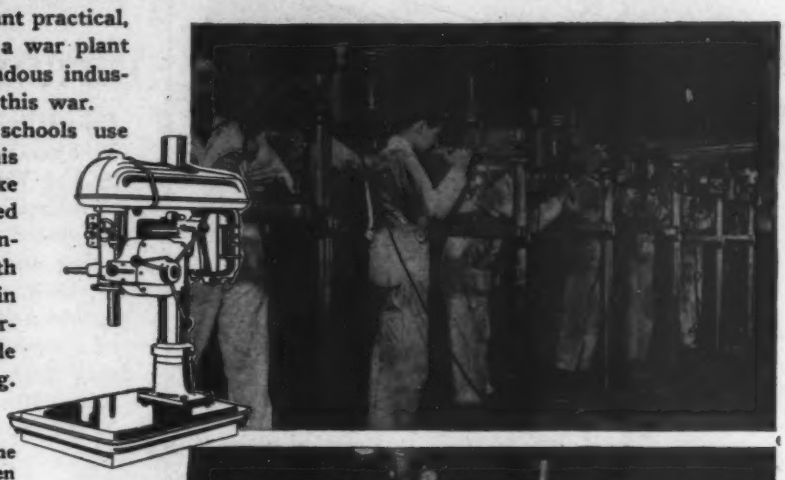

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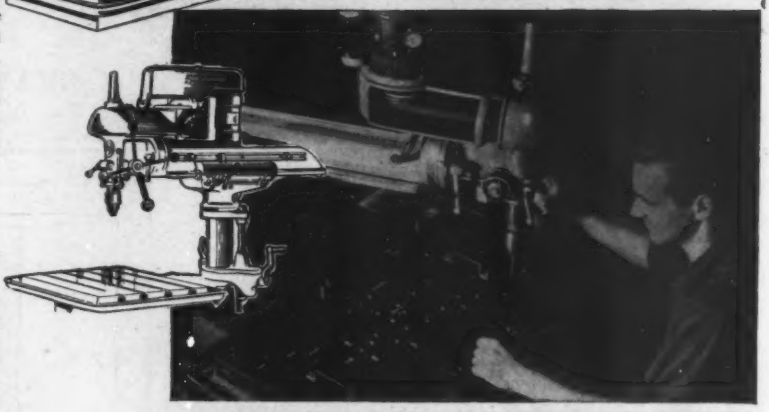

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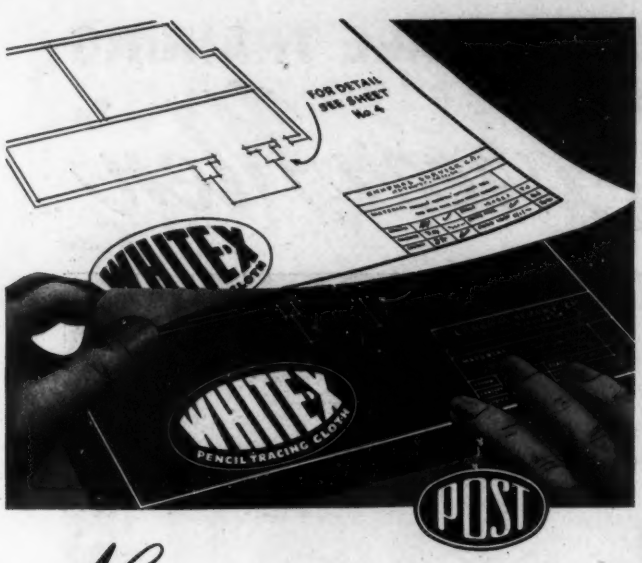

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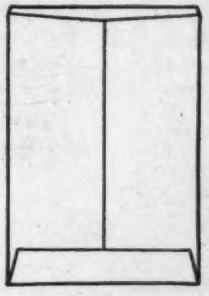

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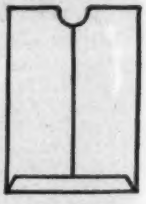

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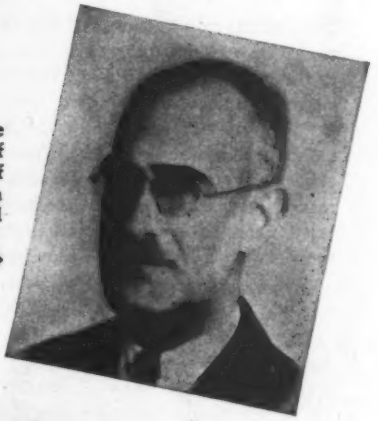

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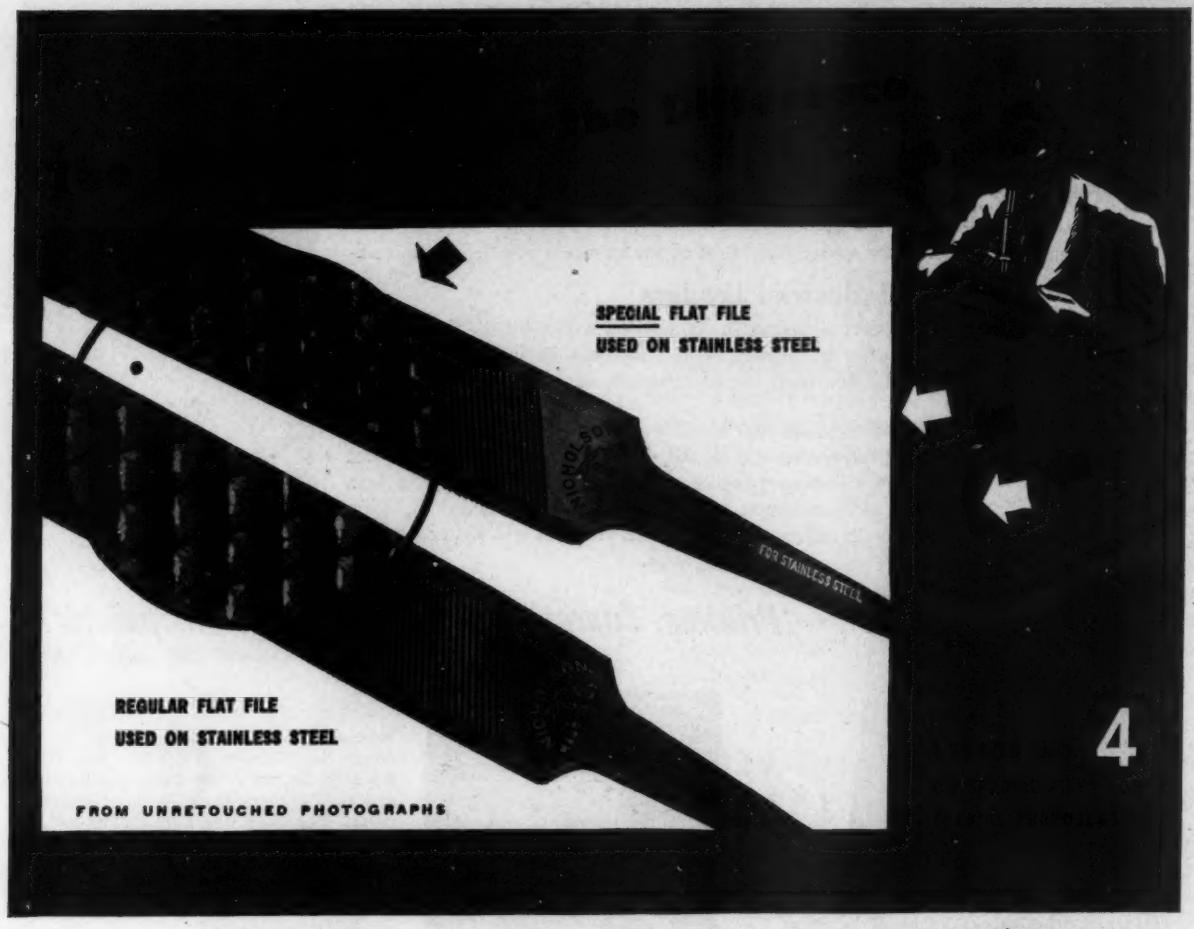

SPECIALIZATION in tools and tool uses continues with growing emphasis—an outcome of the need for utmost production and efficiency in our war industries. School-shop training must keep up with the developments in shop practices and the tremendous strides being made in the fabrication of the newer metals. Nicholson engineering is "right on top" of every new filing requirement—with *The right file for the job.*

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Vol. 32 SEPTEMBER, 1943 Number 7

The School-Opening Number

The first day of school is just around the corner. There is still time for a hurried look around to see whether all the preliminaries have been taken care of, and whether there are not a few details which still need attention.

This planning for the first day is very important, since the first impression very often determines what the student is going to accomplish in a course.

Be sure then to plan carefully and make that first day a real success.

In This Issue

This issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION contains several thought-provoking articles. Probably the one that is of greatest immediate interest to all of our readers is John Seidel's "A Postwar Bill of Rights for American Youth." Then there is Arthur Wilson's "The Vocational Challenge of the War Wounded."

Another very helpful article is the one entitled "Construction of Written Achievement Tests" by William Micheels and Ray Karnes.

Besides those already mentioned, there are ten other articles and a number of projects which may be found helpful at this time for preparing for a successful school year.

This Month's Cover

The Office of War Information and the War Manpower Commission are sponsoring an important wartime informational program for Labor Day, 1943, of Women in Necessary Civilian Jobs.

The cover chosen for the September issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, therefore, is intended to honor the women who devote their energies in patriotically helping the total war effort, so that men may be released for the army.

The half tone shows a woman working on a large production machine. She was prepared for her job by the Detroit school system. Photograph, courtesy of Earl L. Bedell, director, department of vocational education, Detroit, Mich.

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Entered January 2, 1914, as Second-Class Mail Matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1943, by The Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, November 25, 1930. Published monthly except during July and August.

Subscription Information. — Subscription price, $2.50 per year, payable in advance. Canadian postage, 50 cents; Foreign Countries, 50 cents. Copies not over three months old, 35 cents; more than three months, 50 cents. Notice for discontinuance of subscriptions must reach Publication Office in Milwaukee at least fifteen days before date of expiration. Changes of address should invariably include old as well as new address. Complaint of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

PUBLISHED MONTHLY, EXCEPT DURING JULY AND AUGUST, BY THE BRUCE PUBLISHING COMPANY, 540 N. MILWAUKEE STREET, MILWAUKEE 1, WISCONSIN

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SHORT TALKS ON WOOD

OHIO BUCKEYE (*Aesculus glabra*)

The name "horse chestnut" often is applied to this tree but actually there are two separate species. The Buckeye is a native of North America and is used commercially, while the Horse Chestnut was introduced from Europe and is planted principally for ornamental purposes. The wood is soft, light and close-grained. Not strong or durable. Easily worked. Almost white in color.

Buckeye is used for artificial limbs, paper pulp, boxes and crates, fuel and rough construction.

Its range extends from the Appalachian Mountains west to eastern Nebraska, Kansas and Oklahoma. Will grow in rich or poor soil. Never occurs as a pure stand.

Height is usually from 50 to 75 feet, and the diameter from 18 to 24 inches. Trunk is short and knotty. Head is dense, compact and rounded. Has a deep and spreading root system. An attractive ornamental, but short lived and vulnerable to insects, disease and storm damage.

The bark is grayish-brown and broken into flat scales. Emits an unpleasant odor when bruised. The leaves are palmately compound; that is, 5 to 7 leaflets, 3 to 6 inches long and 1 to 2 inches wide, are arranged star-like on the end of the leaf stem. Like the bark they are ill smelling when crushed, in fact, the tree is often called the Fetid Buckeye. In fall it bears a thick, leathery, prickly pod containing a round, brown, shiny nut with a prominent "eye" on one end.

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INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

A Postwar Bill of Rights for American Youth

JOHN J. SEIDEL*

Much has been said — many reams of paper have been used — thousands of ideas have been expressed concerning the problems of youth in America. It is a topic which has a wide emotional appeal and in which every thoughtful citizen is interested. The solution of these youth problems cannot be solved by any one single agency. It must be a cooperative effort of the church, the home, and the public schools, which have been charged with that responsibility for some time. Public school authorities in this country have long been conscious of the many changing influences and of the possible effects on youth of our economic and social changes when developing plans to be used in assisting these youth to become real American citizens. At times school authorities become more and more apprehensive about the great increase in the responsibilities which are gradually being transferred from the home and the church to the school. Probably our recent social and economic development makes these transfers a necessity.

Youth should have every opportunity for self-development under *controlled* stimulation, and *well-planned guidance* and *counseling*. Youth must remember that while we are endeavoring to offer every opportunity for self-development, any program of this type must be balanced by the willingness of youth to accept responsibilities — and they will accept.

There is a great probability that the problems of youth during the postwar era will make the youth problems of the depression seem trifling in comparison. It is with that definite idea in mind that a program of opportunity is presented which may be called "A Postwar Bill of Rights for American Youth" — and this Bill of Rights is presented under four different headings:

I. The Life of American Youth Shall be Less Complex and More *Streamlined*

II. Every Youth Shall Have an Opportunity to Develop a Sense of and Appreciation for Relative Values

III. Every Youth Should Have an Opportunity to Develop a Philosophy of Life for Himself

IV. Every Youth Should be Provided With an Occupational Adjustment Program So That He or She May Reach a Goal of Economic Security

Youth's Life Shall Be Less Complex and More "Streamlined"

What is meant by "streamlining"? Anyone familiar with aerodynamics or engineering knows that unless a body is streamlined, that is, shaped in a certain way, the air currents caused by the passage of that body through air will set up irregular currents and eddies which, in turn, will prove to be very disturbing and tend to decrease the even flow or velocity of that object through space. So it is also with youth. Unless we set up an environment for youth so that he can progress in his development with as little distraction and with as little disturbing influence as possible, we may be sure that the normal and worth-while development of youth will be seriously handicapped.

In order to eliminate these disturbing influences and interfering eddies, we must plan and manage the life of youth so that there is less rush and less conflict of emotions and understandings. We must see that youth itself has a more thorough understanding of the simple purposes of life. Those elements influencing the development of youth during this age should be less complicated and they should be more directly aimed at reaching the desired purposes. For example, the recent development of suburban and semirural areas, outside of large cities, has caused many families to leave the rush of city life, and to move to the more quiet countryside or the peaceful hillsides. But has this moving brought about the desired result? In many cases it has not. Immediately upon entering the more peaceful surroundings, plans are made to have junior or the young daughter attend dancing classes in town, art classes on Saturday mornings, concerts on Saturday afternoons, visits to the dentist every so often, and as a result, there is a constant rushing back and forth which brings about a negative, rather than a positive value.

Again, take the school day, and very often, the school evening, because practically all of the schools expect youth to do *homework*. We have had recent developments of extracurricular activities in schools, supposedly to increase the social abilities and relationships of young people, but, again, what has been the result? Many of these responsibilities which we have given youth and teachers as well have been superimposed upon an already busy day, without displacing any of the traditional or regular courses or studies in the high school curriculum. Seemingly we are trying to hold on to everything we have, both good and bad, and then superimpose our new educational ideas upon an already heavy schedule.

Furthermore, we may have many *artificial standards of achievement* for youth in our elementary as well as in high schools. These artificial standards are used because of so-called standard achievement tests in those so-called fundamentals which are so easily measured; but as far as life or success in an occupation is concerned, many of these fundamentals, as they are taught, make very little direct contribu-

*Assistant State Superintendent for Vocational Education, Baltimore, Md.

tion. Take the matter of arithmetic and the teaching of fractions. How many occupations require youth to multiply fractions smaller than ⅛? And yet it is not an uncommon sight in an elementary school to see the teacher trying to make the pupils achieve success in handling such problems as 1/17 by 1/16. Again, we see teachers require their pupils to subtract $3.96 from $5. That is not the practice in life itself. If a person, after having purchased merchandise costing $3.96, hands a five dollar bill to the clerk, the latter *begins* at $3.96 and makes the change by adding up to $5. We have much to do to teach the fundamentals in the manner in which they are applied in life, rather than the way we are now teaching them.

As a result of the artificial standards which we have set up, children are frequently failed in school. There are a number of places in this country where 16 to 17-year-old youth can be found in the fifth and sixth grades sitting beside 11- and 12-year-old children. In some systems, it has been found that 55 per cent of the children have been failed from one to four times during their first eight years of school. This represents a great waste not only in money, but in human effort and human resources. Most of these failures are due to the artificial standards which have been set up, usually because they can be easily measured by the teacher. Why not let the pupil do what he can and achieve what he may during the ten or twelve years of his school life, without permitting him to be held back and become maladjusted socially.

After all, the large majority of these individuals, whom we look upon as retarded or slow learners in school today, are going into those types of occupation where good work habits and social attitudes are more desirable than high achievement records in school.

Public education must change its philosophy for the seventh to twelfth grade pupils — and this should be done at once. *All* public schools must be ready by the end of the war — *all* — not a few in large cities. If this change is not rapid enough — if the public school authorities are not willing to accept the new philosophy of educating all the noncollege youth of all the people through the secondary school and/or the vocational schools, then certainly some other agency will come into the field of public education and do it for them. This is not an idle threat because every educator in the country knows now that other agencies have made an attempt to take over this responsibility, saying that the schools themselves have not served their purpose for all youth. So much for the streamlining of the life of youth — or, in more simple terms — trying to make an actual, honest, practical adjustment of the in-school and out-of-school life of youth so that youth can derive the most benefit from that time of life known as the "secondary school age."

Every Youth Shall Have an Opportunity to Develop a Sense of, and Appreciation of Relative Values

Anyone dealing with problems on a child level, a youth level, or an adult level, knows that there are very few *yes* and *no* answers to the problems that confront him. The more seriously the problem is studied, the more the answer must be qualified. After all, a valid answer can only be based on a comprehensive knowledge of the facts, so that the pros and the cons may be stated; or the plus values and the negative values may be matched, to see which carries the greater weight. Then, in order to have youth develop this sense of relative values, we must allow them to experience and actually feel problems. We must vitalize our school practices so that youth will have an opportunity to weigh the pros and cons, to weigh advantages against disadvantages, in order to see whether the balance sheet shows a plus or minus. We know that decisions are necessary and that decisions must be made, but valid decisions are only made after all factors are carefully considered. To develop this *relative sense of values* in youth requires courage on the part of adults. Probably the easiest procedure would be to *tell* youth the answers — to say *yes* or *no for* youth, and *decide* their problems *for* them. But what would be the result? It would be the same as assisting an individual, step by step, up a flight of stairs, only to find him falling back *after* he has reached the top, and probably injure himself to such an extent that he remains permanently handicapped. *It means that we must have confidence and faith in youth from the very beginning*, and that we must start to assist him with the smallest problems, help him in seeing relative values and evaluate results, so that as he develops through his youthful period, he will gradually acquire the ability to handle more and greater problems in an efficient manner so that when he reaches maturity the big problems of life will not daunt him.

Every Youth Should Have an Opportunity to Develop a Philosophy of Life for Himself

Youth must learn to appreciate that things do not "just happen." He must be led to see that any success that may be gained is the result of previous planning and previous effort to arrange the circumstances so that the desirable results may be obtained. He must also be led to realize that to act contrary to the plan, and to act contrary to well-directed effort will invariably bring about negative and undesirable results. He must be assisted in establishing ideals that will serve him as a beacon by which to set his course. We often hear a young man referred to as a *fine youth*. Such a youth possesses such ideals as respect for other's rights, consideration of others' feelings, sympathetic attitude toward those in distress, the ability to accept victory without self-inflation and to accept defeat without ill will or vindictiveness. He has the ability to govern his emotional impulses by rational thinking.

All of these factors are not taught from books. They are not obtained by learning a theorem in geometry or by declining a verb. Rather are they the result of the influence of home, church, and school environment on the individual. It should be the purpose of the school to supplement and augment the efforts of the home and of the church in this respect because these characteristics just enumerated are developed as a result of human relationships, of examples set forth by adults, a responsibility in which every teacher must share.

Every Youth Should Be Provided With an Occupational Adjustment Program So That He or She May Reach a Goal of Economic Security

So far the youth problem has been treated from the standpoint of his or her social development. To develop the social ability of youth in order that they will be socially desirable in a home, in a group, or in a community, is but *part* of the story, because, after all, youth will have to *live*, and youth will want those things necessary to make life *worth while*.

Every year there are two million young people reaching the age of 17; another two million reaching the age of 18; and another two million reaching the age of 19, and so on. Therefore, each year there are two million young people leaving their homes, discarding the economic protection of the family, venturing forth to earn their own living, or endeavoring to secure individual economic security. In addition, many of these youth are married, and take on the responsibilities of family life. Certainly before this step is taken, the schools have a very definite and specific responsibility to see that youth is prepared to take this most serious step.

All of this points to the importance of the *adjustment of youth*. While during the present abnormal times, it is becoming less and less difficult for youth to gain employment, yet we must remember that during the depression years through which we passed just a few years ago, the average youth was unemployed for three years after he left school. As a matter of fact some youth were unemployed for six years after they left school; surely a horrible situation and one which will kill the initiative and normal development of almost any youth. As the minimum employment age of youth is raised, and as the beginner's *wage* is increased, employers will *expect* more of youth, and those youth who, formerly, just *found* a job, or stepped

into a single-skilled occupation, will need greater assistance in *getting ready for a job*. Therefore, *youth has a right to expect public school authorities to assist him in becoming occupationally adjusted.*

Three major elements must be incorporated in any effective program of occupational adjustment:

1. Guidance and counseling
2. Educational experiences of a practical nature so that skills may be developed
3. Placement and follow-up on the job

Before offering vocational guidance to the noncollege youth we must consider the opportunities for employment for youth. Almost all types of occupations in the major families of jobs, industry, business, agriculture, public service, will fall into four major classifications:

1. Junior occupations
2. Semiskilled or single skilled
3. Multiskilled, journeymen, or craftsmen
4. Supervisory or managerial

Chart No. I is a graphical representation showing the approximate minimum and maximum age of employment in any of the four classifications just mentioned.

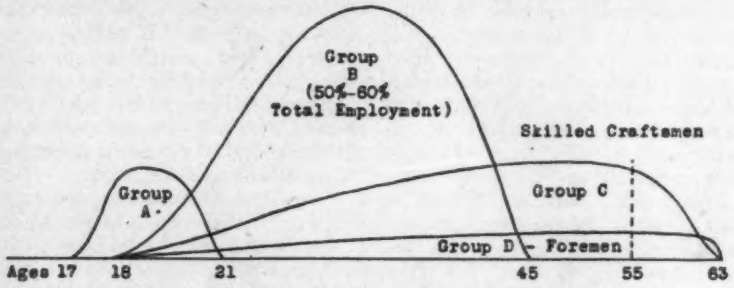

Chart I. Distribution of age groups in industry

Curve A shows the junior occupations, such as messenger boys, bundle boys for delivery trucks, chore boys for farms, kitchen cleanup help, soda dispensers, delivery boys for grocery stores, drugstores, and the like.

These types of occupations need little or no skill training; more important is neat dress, attitude toward public, courtesy, loyalty, punctuality, etc. Very few people are employed in these occupations after 21 years of age. Some people call them *blind alley jobs*, yet they afford opportunities to develop certain social or personal characteristics which are exceedingly desirable for future employment or occupational advancement.

Curve B: This embraces occupations on the operative level, single-skilled occupations, power sewing, machine operators, button-hole machine operators, coat-sleeve sewers, textile mill-machine operators, lathe operators, drill-press operators, transcriber, dictaphone, typists, punch-press operators, farm hands, harvest hands, card-punch machine operators, aircraft riveters, and the like.

These occupations need development in one skill only, which can be acquired in a short period of time. Workers in these occupations must be satisfied to do repetitive type of work, seldom get in touch with the public while at work, and to endure much noise while working. Many of these jobs require quick repetitive action, and extremely high finger dexterity. Beginning age is 18, but practically all lose jobs before they are 45 years of age because age slows up the speed of production. While the general impression was that industry does not want anyone over 45 years of age, the statement applies to this group of employees only. The number of employees in this classification heading is, of course, quite large and embraces probably 65 per cent of all workers. Technological change may bring about sudden displacements in this group.

Curve C: This curve encompasses all-round mechanics, craftsmen, journeymen, secretaries, stenographers, senior salespersons, dairy herdsmen, farm overseers, tool- and diemakers, master plumbers, construction maintenance mechanics, custom tailors, master craftsmen, and those working in semiprofessional occupations.

These occupations demand development of mechanical ability beyond the apprenticeship period of training. It not only requires a high degree of manipulative ability, or mechanical skill on the part of the individual, but the individual must have obtained a considerable amount of technical knowledge, developed job judgment, and job intelligence based on experience in his particular type of work. The stability of employment of the individuals in Curve C is rather high, and many remain on full-time employment until 50 to 60 years of age. They are often referred to as *an old-time, all-round mechanic* who is a master of his trade. These men have superior intelligence; in all probability their character and integrity is beyond reproach; they are relatively calm, thorough, and deliberate in their action. They are the foundation of good citizenship in industry.

Curve D: The group embraced under this curve encompasses foremen and supervisory occupations, masters, shop superintendents, gang bosses, quartermen, and other individuals who are handling or in charge of other workers.

This type of occupation needs development, not only in the particular manipulative skill, job judgment, intelligence, and technical information, but, in addition, requires persons trained in the handling of other workers. Such workers must be leaders, who are interested in their men, and can handle them through suggestion, sympathy, and stimulation. It is also found that persons employed in this type of occupation remain on the job until 55 or 60 years of age, showing a rather high degree of stability in employment.

The description of all classifications of workers shown in the chart should be of invaluable assistance in developing the guidance phase of any occupational adjustment program. After preliminary interests, aptitudes, and personal factors of each pupil have been studied and reviewed, then a tentative selection of a vocational program should be made available for each pupil.

Then the second phase — that of vocational training — enters the picture. Chart No. II attempts to describe the a, b, c of a complete occupational adjustment program for noncollege youth. Before studying the details of this chart, we should be quite conscious of the fact that everyone in any service or occupation, be he the ditch digger, the laborer, the doctor, the lawyer, the salesman, or the mechanic, must have developed two sets of characteristics if he is to be an effective worker and efficient on the job.

The first set of characteristics may be classified as those of a personal nature; i.e., items may be listed under this classification as loyalty, honesty, willingness to work, thoroughness, accuracy, punctuality, and many other similar elements which help to make a good citizen, as well as a good worker.

Under the second classification, one should consider the functional characteristics as those which give evidence that the person can perform in an efficient manner the job which he is supposed to do. For instance, he or she is an excellent machine operator, typist, clerk, has the ability to sell, has the ability to instruct others in the skills which make them effective in their particular type of work.

Keeping in mind the two sets of characteristics, we then study Chart No. II which show a 5-year program between the end of what might be called the general education and preliminary guidance, and full-time employment. The two years in the *A* portion of the program are a type of educational experience opportunity in which the youth may spend at least half of his time in acquiring practical educational experiences. It may be shopwork, agriculture, home economics, business education — any type of educational experience which is going to assist the individual in preparing for a chosen occupation. It need not be too specific in nature since the emphasis of development of the individual

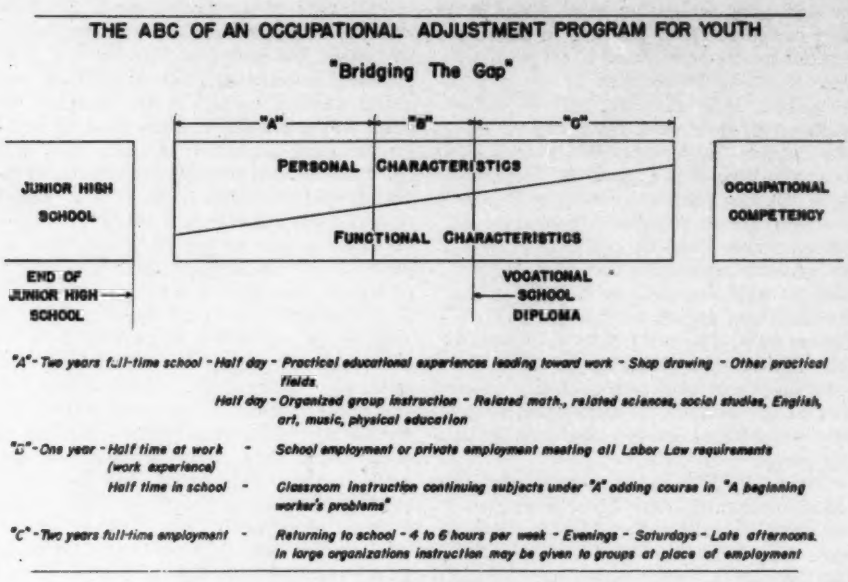
THE ABC OF AN OCCUPATIONAL ADJUSTMENT PROGRAM FOR YOUTH
"Bridging The Gap"
"A"
"B"
"C"
JUNIOR HIGH SCHOOL
PERSONAL CHARACTERISTICS
FUNCTIONAL CHARACTERISTICS
OCCUPATIONAL COMPETENCY
END OF JUNIOR HIGH SCHOOL
VOCATIONAL SCHOOL DIPLOMA
"A" - Two years full-time school - Half day - Practical educational experiences leading toward work - Shop drawing - Other practical fields
Half day - Organized group instruction - Related math., related sciences, social studies, English, art, music, physical education
"B" - One year - Half time at work (work experience) - School employment or private employment meeting all Labor Law requirements
Half time in school - Classroom instruction continuing subjects under "A" adding course in "A beginning worker's problems"
"C" - Two years full-time employment - Returning to school - 4 to 6 hours per week - Evenings - Saturdays - Late afternoons. In large organizations instruction may be given to groups at place of employment

Chart II. Occupational adjustment diagram

during this period should be placed on the growth and personal characteristics.

In the second section of this 5-year program, each section is one year in length and is what we constantly think of as part-time, cooperative work — at least half time on the job in employment and half time in school. High schools should give credit for this experience on the job, just the same as if the individual had been attending shops and laboratories in the school. In fact, in many cases there would be greater justification for this type of work experience on the job rather than full time spent in school.

At the end of the *B* period in this program, the individual should receive a high school diploma, then enter employment, returning to school for two to four hours per week for continued study in technical knowledge and problem solving of difficulties on the job. This period may last from one to two years. It could very easily be used as an apprentice training period. At the conclusion of the *C* period, the individual is then ready for full-time employment.

The diagonal line running through this 5-year period shows the relative emphasis of personal characteristics and functional characteristics, fully realizing the fact that skills can be developed more efficiently in employment and on the job than in school.

The vocational agriculture program and the home-economics program lend themselves so well to the development of youth in the occupational adjustment program, as shown in Chart No. II, since the development of the functional characteristics can be developed on the farm or in the home. It is more difficult to develop those functional characteristics in the second two stages of the chart because of the reluctance on the part of employers to employ these youth for training purposes. However, considerable progress is being made in many states in this respect.

If, during periods of depression, when private employment will be almost impossible for these individuals, it is quite possible to see schools offering work experience programs in the place of work experience in private employment.

It is agreed that Chart No. II may be somewhat idealistic in nature; yet there are elements of the program which are being used constantly in many places in the country; therefore, it is reasonable to expect that continued development will take place and that more and more youth will have the privilege and opportunity of that type of educational development.

As a result of this Bill of Rights, it is but a reasonable expectation to have youth expect these opportunities as a privilege. In a democracy all privileges are accompanied by responsibilities, so if American youths develop (1) in an atmosphere of emotional stability, wholesomeness, and sincerty, (2) in an environment offering an opportunity to realize a sense of relative values, (3) in a youth world, developing a youth philosophy of life, (4) become occupationally adjusted for adulthood, the result cannot help but be a citizen loyal to the ideals of American democracy, proud to accept the responsibilities of adulthood.

WHAT IS CONDITION OF FIRST-AID CABINET IN YOUR SHOP?

Due to the fact that accidents are not numerous in a school shop, the condition of the contents of the first-aid cabinet is not always the best. Does the cabinet contain the proper supplies? Your local doctor will aid you on this point. Are all the contents fresh and clean, or are many items old and dirty from use? Are the various solutions properly labeled? Do you have a reserve stock of supplies? A check of the above may prevent a simple injury from becoming quite serious.

— From *Organization and Instruction of Evening Classes*, Vocational Education News Letter, Pittsburg, Kans.

Model aircraft exhibit arranged by Paul Brewer, instructor at the Knoxville High school. Photograph submitted by Hugh J. Betts, supervisor of industrial arts, Knoxville, Tenn.

Construction of Written Achievement Tests*

WILLIAM J. MICHEELS** and M. RAY KARNES***

The informal written achievement examination remains one of the most important of the several devices used to measure student progress. Because it is often made and used haphazardly, this type of test should be considered and studied closely by the teacher, supervisor, and administrator. It is to the construction of the written achievement test that this article is devoted. Basic principles and specific construction points to be observed are presented.

The reader must keep in mind that there are other important instruments for measuring the many outcomes of instruction. Among these are the oral test, standardized achievement test, performance test, observation check list, and the rating scale. They are used to supplement written achievement examinations in arriving at a better picture of the attainment of the students.

Before considering the steps to be followed and specific points to be observed in constructing informal achievement tests, it is well to review the characteristics of a good examination.

Characteristics and Requirements of a Good Test

An achievement test must meet certain requirements if it is to serve as an effective measuring device:

1. *The test must be valid.* A test is said to be valid when it actually measures what it is *supposed* to measure. This is the most important feature of a good examination. A test designed to measure the student's ability to use and apply certain facts learned in technical courses is not valid for that purpose if it measures only the student's ability to recall and write these facts on paper. It must measure application of facts rather than mere memorization.

As a part of the process of standardizing a formal test, an index of its validity can be obtained by computing the coefficient of correlation between scores on the test and measures of some predetermined criterion of validity. However, the usual method of estimating the validity of an informal teacher-constructed test is to have several competent individuals carefully go over the content and test results to determine how well the examination does what it is supposed to do. Although the test maker may have only subjective means at his disposal, he must give careful consideration to the extent to which the test actually measures what it is designed to measure.

2. *The test must be reliable.* A test is said to be *reliable* when it measures accurately and consistently what it *does* measure. If the test measures in exactly the same manner each time it is administered, if the factors that affect the test scores affect them to the same extent every time the test is given, the test is said to be high in reliability. A highly reliable test, then, should yield essentially the same score when administered twice to the same student, providing, of course, that no learning occurs while the test is being taken the first time or no learning or forgetting takes place between testings.

Although treated separately, reliability and validity are closely related. Reliability is considered a factor in validity. A test cannot be extremely high in validity and low in reliability. Presumably, if the test does not measure accurately and precisely, there must be variable factors other than achievement that affect the score. Certainly the test would not measure very well what it is supposed to measure if it failed to measure accurately whatever it does measure. High reliability does not insure high validity, however. A test can measure with extreme accuracy whatever it *does* measure, but fail to measure what it is *supposed* to measure. Validity is sometimes decreased by an overemphasis upon reliability. Again, validity, because it is related to the purpose, is the most important feature of a test.

Whereas the validity of an informal written examination is usually determined by more or less subjective means, an accurate estimate of the reliability can be determined by a precise mathematical procedure — provided that a sufficient number of test papers is accumulated.

3. *The test must be objective.* The personal judgment of the individual who scores the test must not be a factor affecting the score. Different individuals scoring the same test paper or the same individual scoring the same paper at different times must arrive at the same score if the test is to meet the full measure of this requirement.

It is obvious that the so-called old-type or essay tests, as usually constructed and scored, register poorly when measured by this standard. Instructors competent to judge rarely agree on the score that should be recorded for a given essay test paper. They do not have a common objective basis for marking. Instructors often notice that students are making higher marks than usual and begin to grade the tests "harder," that is, they begin to take off more points for errors. Such a system of scoring is not objective and should not be tolerated in a testing program.

In order to get an appreciation of the subjectivity of the ordinary essay or discussion type test, one has only to select several competent instructors of the same subject and have each one score independently the same test paper covering materials that they teach. There will be considerable variation in scores recorded for the single test paper. If the same instructors score the same test paper again one week later, the difference between the first and second set of scores will again be considerable.

It is not to be assumed that the essay type item should be eliminated altogether from tests. When carefully constructed, it measures well the ability of the student to organize and express his thoughts. Specific points on the construction and use of essay type items will be presented later.

The aspect of objectivity which has been described is concerned with the scoring or marking of test papers. Another aspect, equally important but more subtle and therefore more frequently neglected, has to do with the students' interpretation of the items in the test. Well-constructed test items should lend themselves to one and only one interpretation by students *who know the subject matter involved.* That is, a given test item should mean essentially the same thing to students who know the point in question. Items should be stated clearly so that students will know what information is desired. Items which are ambiguous or have double meanings should be carefully "weeded out" if the test is to be objective from the student's point of view.

4. *The test must discriminate.* The test must be constructed in such a manner that it will detect or measure small differences in achievement or attainment. This is an absolute essential if the test is to be used for ranking students on the basis of achievement or for assigning marks.

Three things will be true of a test that meets this standard:

a) There will be a wide range of scores when the test is ad-

*This is the seventh in a series of articles written by staff members of the Teacher Training Department, Armored Force School, Fort Knox, Ky. Brig. Gen. J. A. Holly is the commandant and Lt. Sidney C. Carpenter is the director of the teacher training.

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ministered to students who have actually achieved amounts that are significantly different. If the *full range* of achievement is to be measured, scores are likely to vary from the lowest to the highest possible score. However, for practical purposes, and for most subject-matter fields, scores should vary from near the highest possible score to a score that is less than half of the total number of points on the test.

b) The test will include items at all levels of difficulty. That is, the items will vary uniformly in difficulty from the most difficult one, which will be answered correctly only by the best students, to an item so easy that practically all of the students will answer it correctly.

c) Each item will discriminate between students who are low and those who are high in achievement. Each item will be missed more frequently by poor students than by good students.

As is true with validity, reliability, and objectivity, the discriminating power of a test is increased by concentrating on and improving each individual item in the test. After a test has been administered, a simple item analysis can be made which will readily show the relative difficulty of each item and, of greater importance, the extent to which each discriminates between good and poor students.

5. *The test must be comprehensive.* It must sample liberally the objectives that are being measured. A test should be comprehensive enough to be valid, that is, it should be long enough to do what it is supposed to do.

6. *The test must be readily administered and scored.* Consideration must be given to the features of the test which make it readily administered and scored. It must be so devised that a minimum amount of student time will be consumed in answering each item. The test items must also be constructed in such a manner that they can be scored quickly and efficiently.

The Procedure to Follow in Constructing Tests

If a test is to be valid, reliable, and objective; if it is to be comprehensive, discriminating, and easily administered and scored, a definite, systematic procedure must be followed in its construction. One such procedure is itemized briefly below:

1. Decide on the specific points or objectives that are to be measured.
2. Write each objective on a separate sheet or card. List items of subject matter which contribute to the realization of each objective.
3. Determine which type of test item will measure best the extent to which each specific objective has been attained.
4. Construct one or more test items for each objective listed.
5. Assemble the items for the test. List all items of the same type (completion, matching, multiple choice, and so on) together. Arrange questions within each type so that those concerning related material appear together.
6. Write clear and concise directions for each type of question.
7. Study every aspect of the assembled test.
8. Have other instructors criticize and actually take the test.
9. Make any necessary revisions.
10. Construct the key.
11. After the test has been administered to one or two groups of students, study carefully the student responses. Correct any weaknesses that they reveal. Continue to revise and improve the test from time to time.

Specific Points to Observe in Constructing Tests

There are many specific points that must be kept in mind as an effective test is constructed. Some of these points are listed below. Others will be presented later in the discussion of the various types of test items.

1. Make the mechanics of the test as simple as possible.
2. Include several types of test items.
3. Do not include one item that supplies the answer to another.
4. Make each item independent of the others. Do not have the correct response to one item dependent upon the response to another.
5. Make the test comprehensive, but exclude trivial and insignificant items. Sample the whole range of instruction up to the time of the test.
6. State questions clearly; eliminate ambiguous items.
7. Include a large number of items in the test. This tends to increase the reliability.
8. As far as possible, arrange the items in the order of their difficulty.
9. Keep the method of recording responses as simple as possible. The technique of answering test items can easily become more difficult for the student than recalling or recognizing the information needed to make the response. Involved methods of indicating responses tend to measure general intelligence rather than achievement.
10. Arrange the items in such a manner that it will not be necessary for the student to refer to more than one page in answering a given item.
11. Include no item for which the answer is obvious *to a person who does not know the subject matter.*
12. Arrange blanks for responses along one side of the page if possible. This facilitates scoring.
13. Arrange items so that responses will not form a particular pattern.
14. Make certain that the type of test item used for measuring each objective is the one that will measure best that objective. Remember that certain types of test items have advantages over others, but that these are *specific* advantages in *specific* situations.
15. Leave sufficient space for all responses without crowding.
16. Number the responses consecutively from the beginning to the end of the test.
17. Avoid the weighting of items. Each single response should be numbered and should count one point. The number of points that a test item should count will depend upon the number of responses required in that item. If a particular point is highly important and you wish to stress it in a test, call for several responses concerning it. Measure the student's knowledge of it by setting up several situations in which the point is involved.
18. Use as many questions as possible that require the student actually to apply things learned rather than merely recall or recognize facts.
19. The practice of underlining crucial words tends to increase the objectivity of test items if not done too frequently and indiscriminately.
20. Directions should be complete. They should state clearly and concisely:
    a) *what* the student is required to do
    b) *how* the response is to be indicated, and
    c) *where* the answer is to be placed
21. The directions should include at least one example of an item correctly answered. A large number of incorrect responses can be traced directly either to the student's failure to understand the intent of the directions or his failure to read them carefully. Make the test fair to the student.
22. Examples accompanying directions should be taken from the subject matter of the test. Make the examples meaningful. Use them to teach certain points.
23. If correction for guessing is to be made when scoring the test, this should be indicated in the directions. It is recommended, however, that no attempt be made to correct for guessing.
24. Concentrate on individual items in the test. Improve them.
25. Word questions in the simplest manner possible. Confine the terms used to the vocabulary level of students.
26. Keep in mind that it is not possible to measure all outcomes of instruction with written tests. Do not try to measure manipulative skills with written tests. The performance test is much more effective.
27. Avoid trick or "catch" questions.
28. A card file can be used effectively to accumulate new items for both daily and final tests.

29. Avoid questions to be answered by *yes* or *no* when other types of items can be substituted.

30. When possible, keep the responses short.

31. Include items at all levels of difficulty to insure a significant range of test scores and to get discrimination.

32. Do not "lift" statements directly from books and use them as test items.

33. In designing recall questions, determine what information is to be supplied; write out the answer, and then construct a test item that will test the student's knowledge of the answer.

34. Make out the key or the answers to the questions at the same time that the test is made.

Characteristics and Construction of Specific Test Items

An effort has been made to stress the importance of selecting for each objective to be measured the specific item that will measure it most effectively. Brief descriptions, including uses and limitations, of the common types of test items, together with specific points to be observed in constructing each, are presented here.

Objective test items are usually classified broadly into five main types: (1) alternate-response items (true-false), (2) multiple-choice items, (3) matching items, (4) free-response items, and (5) completion items.[1] The following descriptions include these main types together with variations of them. Examples of each type are also included. The explanations and examples will serve as guides to be used in designing test items for various types of subject matter. Observe the types of items described and explore the possibilities of adapting variations of these to the particular subject with which you are concerned. Other types can be conceived. Give special attention to the directions that accompany the examples.

Several of the test items to be presented are classified as *recall* test questions. The listing or enumeration, the simple completion, and the essay-type test items require the student to recall certain information in order to make correct responses. Mechanics in the field must be able to recall certain important points of information taught in technical courses if they are to take full advantage of their training. It follows that test items designed to measure the extent to which students have mastered points of information of this nature must be of the recall type. Students often can recognize correct responses when listed among other responses and still are not able to recall the correct responses. If effective use of certain information being taught involves recall, then we must *teach* and *test* for recall of that information in purposeful situations.

True-False (Alternate Response)

The unmodified type of true-false test item consists of a simple statement that may be either true or false. The student is required to indicate whether or not the statement is true. This type of test item has been used extensively and often indiscriminately by instructors. The plain true-false item is not strongly recommended for use in *achievement* tests. However, variations or modifications can be used effectively.

Examples:

Directions: Listed below are a number of statements. Some are true and some are false. If the statement is true, encircle the "T" at the left of the statement. If the statement is false, encircle the "F." The first item is answered as an example.

(x) T (F) The contacts of the breaker points are made of copper.
(1) T F The circuit breaker on the motorcycle opens and closes the secondary circuit.
(2) T F In order to adjust the front chain of a motorcycle the transmission has to be moved in the frame.

Directions: Some of the following statements are true and some are false. If the statement is true, place a plus (+) in the blank space at the left. If the statement is false, place a zero (O) in the space. The first item is answered as an example.

(x) .+... Heising modulation is employed in the radio set SCR–194–195.
(1) ..... In superregenerative receivers, the detector breaks into and out of oscillation at an audible frequency.
(2) ..... A Hartley circuit is used in the oscillator of the BC–191A.

Uses, advantages, and limitations:

1. The true-false item can be used effectively as an instructional test item to promote interest and to introduce points for discussion.
2. It can be used to sample effectively wide ranges of subject matter.
3. It can be scored readily in an objective manner.
4. It can be made a factual question or a thought question that requires reasoning.
5. It can be used to sample a wide range of subject matter.
6. It has doubtful value as an item for measuring *achievement*.
7. Difficulty is encountered in constructing items that are either completely true or false without making the correct response obvious.
8. It encourages guessing. Approximately 50 per cent of the items can be marked correctly without any knowledge of the subject matter involved.
9. A true-false test is likely to be low in reliability unless it includes an extremely large number of items.

Points to be observed in constructing the true-false test item:

1. Make approximately half of the items true and half false.
2. Do not make one part of a statement true and the other part false.
3. Do not make the true statements consistently longer than the false statements.
4. Direct students to indicate responses by one of the following methods: (1) encircle "T" if true and "F" if false, (2) mark true items plus (+) and false items zero (O, not minus (—), (3) write "True" or "False" before the statement, (4) encircle or write "Yes" or "No" as the answers to direct questions.
5. Avoid negatives and involved statements.
6. Make application of things learned in as many of the items as possible.
7. Avoid using such words as "all," "none," "never," and so on, in such a manner as to make them "specific determiners."
8. Where possible, make the crucial elements come near the end of the statement.

Cluster True-False

The cluster true-false item consists of an incomplete statement followed by several phrases or clauses, each of which will complete the statement. The student is required to indicate those phrases or clauses that form true and those that form false statements. This type has not been used extensively but is considered more effective than the simple true-false item. It is sometimes called a multiple response type item.

Examples:

Directions: Each of the incomplete statements below is followed by several items, each of which will complete the statement and make it either true or false. Place a plus (+) in the blank space to the left of each item that makes a true statement. Place a zero (O) in the blank space to the left of each item that makes a false statement. The first item is answered as an example.

TNT is an explosive which

(x) ..O.. is very sensitive to shock and friction.
(1) ..... most nearly meets the requisites of an ideal military explosive.
(2) ..... is 90% stronger than nitrostarch.
(3) ..... has the same relative strength as 50% dynamite.
(4) ..... is usually detonated with special tetryl caps.
(5) ..... can be used effectively when frozen.

[1] Walter S. Monroe, editor, Encyclopedia of Educational Research, p. 1290.

Manila rope
(11) ..... should be coiled opposite to the lay of the rope.
(12) ..... should be stored in a cool, dry place.
(13) ..... will last longer if it is tar treated.

A magnetic field
(1) ..... moved around a conductor generates an electric current.
(2) ..... is generated when a current flows through a conductor.
(3) ..... is not generated when electricity flows through a coil.
(4) ..... can be cut by a moving conductor to generate an electric current.
(5) ..... has no relation to the emission of radio waves.

Uses, advantages, and limitations:

1. The cluster true-false item possesses all of the advantages of the plain true-false. It possesses several additional advantages.
2. It can be used to check several points with respect to such things as a particular concept, principle, or mechanical unit.
3. It requires less space and time per point.
4. It tends to reveal more closely the student's complete understanding.
5. It is considered slightly higher in reliability than the simple true-false type.

Points to be observed in constructing cluster true-false items:

1. Design items that require the student to make application of things learned.
2. Make all of the responses plausible and approximately half of them true.
3. Avoid qualifying words that make the answer obvious.
4. Check each item carefully for ambiguous and hidden meanings.

Modified True-False

There are many variations and modifications of the true-false test item. These modifications have much greater testing value than the plain true-false item and compare favorably with other types. Modified true-false items may be designed to require the student merely to mark the items that are true *and* "modify" the false items by (1) crossing out the word that makes the statement false, or (2) identifying the word that makes the statement false and listing another word that would make it true. Another variation requires the student to write a brief statement to justify his response whether true or false. Still another modification has the student choose the correct word from a list of words given.

The variations and modified forms should be substituted for the plain true-false item wherever possible. The construction of these forms requires much skill and practice.

Examples:

Directions: Some of the following statements are true and some are false. If the statement is true, encircle the "T" at the left and *do no more.* If the statement is false, encircle the "F" and *do two more things:*

1. In blank "A" insert the word that makes the statement false.
2. In blank "B" insert the word that would make it true.

Do not use the words that are underlined. The first item is answered as an example:

(x) T (F) *Spark plugs should be inserted* with approximately 60 foot-pounds tightening torque.
A. Sixty ..... B. Forty .....
(1) T F *The Homelite generator* should be set to put out about 50 amperes on the heater lead.
A. ..... B. .....
(2) T F *With correct valve clearances* the Wright engine has about a 5-deg. overlap.
A. ..... B. .....
(3) T F The *main purpose of the Homelite generator* is to supply current for the turret.
A. ..... B. .....

Directions: Some of the following statements are true, some are false. If a statement is true, encircle the "T" at the left and do no more. If the statement is false, encircle the "F" *and underline* the one word that makes it false. The first item is answered as an example.

(x) T (F) The contact points of the breaker points are made of *copper.*
(1) T F The scavenger pump returns the oil to the oil tank.

Directions: Some of the following statements are true, some are false. If a statement is true, encircle the "T" at the left and explain why it is true in the blank spaces below the item. If the statment is false, encircle the "F" at the left and explain why it is false.

(x) T (F) The WLA model motorcycle has a horizontal engine with opposed cylinders.
Explanation: The WLA model is ..... equipped with a V-type engine.
(1) T F The purpose of the oil bath air cleaner is to clean the oil.
Explanation: .....

Multiple-Choice

The multiple-choice item consists of an incomplete statement followed by several phrases, words, or clauses from which the student must select the one that will complete the statement in accordance with directions given.

The multiple-choice test item in its various forms is one of the most valuable types that can be incorporated in a written test. Several of the variations are described below:

1. *One right answer.* This is the simplest kind of multiple-choice item. The student is required to identify the one correct response listed among several that are totally wrong but not obviously wrong.

Examples:

Directions: Each of the incomplete statements listed below is followed by several words, phrases, or series of numbers. From these choose the one which, when added to the incomplete statement, gives a true statement. Place the letter of that word or phrase (A, B, C, D, or E) in the numbered blank space at the left of the item. The first item is answered as an example.

(x) C ... The correct firing order of a seven-cylinder radial engine is
A. 1-5-2-6-3-4-7
B. 1-3-5-7-4-2-6
C. 1-3-5-7-2-4-6
D. 1-2-3-4-5-6-7
E. 2-4-6-1-3-7-5

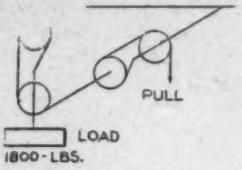
(1) ..... If several resistors are connected in parallel to a current source, the voltage
A. increases and the amperage remains constant
B. decreases and the amperage decreases
C. remains constant and the amperage decreases
D. remains constant and the amperage remains constant
E. decreases and the amperage remains constant

(6) ..... Overmodulation will cause
A. a loud signal
B. a far-reaching signal
C. distortion
D. fading
E. overloading or resonant circuits

(8) ..... A log, 30 in. in diameter, is blocking the movement vehicles. This is to be cut in two places with an external charge of TNT. This operation will require
A. 45 blocks
B. 8 blocks
C. 90 blocks
D. 36 blocks
Show calculation here.

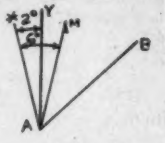
(10) ..... The theoretical pull required to support the load on block and tackle shown herewith is

A. 360 lb.
B. 200 lb.
C. 300 lb.
D. 450 lb.



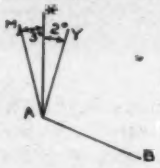
Directions: A diagram is drawn for each of the following questions. Convert from one azimuth to another as indicated in the statement of the questions below. Following each statement are several possible answers. Place the letter corresponding to the correct answer in the blank space at the left of the statement. The first statement is answered as an example.

(x) *B*.. The magnetic azimuth of the line A–B is 50 deg., what is its grid azimuth?



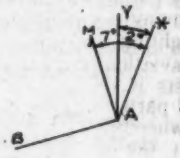
A. 46°
B. 54°
C. 56°
D. 44°
E. 58°

(25) ..... The magnetic azimuth of the line A–B is 142 deg., what is its grid azimuth?



A. 147°
B. 140°
C. 137°
D. 144°
E. 145°

(26) ..... The grid azimuth of the line A–B is 188 deg. 30 ft., what is its magnetic azimuth?



A. 181° 30′
B. 190° 30′
C. 195° 30′
D. 193° 30′
E. 186° 30′

2. *Best answer.* This variation requires the student to select the correct answer or *best* response from a series of possible responses. It is the most valuable of the several forms of the multiple-choice items in current use. It has been severely criticized, however, because the selection of the best response involves an element of judgment. This is not a valid criticism. The fact that it does require judgment to select the best response is the most important feature of the item. A great deal of teaching is done with the specific purpose of getting students to the point where they can form judgments, draw conclusions, make close discriminations, and arrive at decisions. We must *teach* and *test* for these abilities.

Examples:

Directions: Each of the incomplete statements below is followed by several phrases. From these phrases choose the one which, when added to the incomplete statement, gives the *best* or most nearly correct meaning. Place the identifying letter of that phrase (A, B, C, etc.) in the numbered blank space to the left of the item. The first is answered as an example.

(x) *A*... The position from which the forward observer can best perform his duty is:
A. with the leading wave of the assault tanks
B. with the leading wave of the support tanks
C. with the most forward battery
D. in an airplane above and ahead of the leading tanks

(13) ..... Artillery should be placed in the marching column as follows:
A. in the center of the main body
B. in the advance party
C. no farther back than the head of the main body
D. at the tail of the main body

(14) ..... In going into position the first or main consideration in selecting a position is
A. good field of fire
B. good cover
C. good concealment
D. good road to position

(15) ..... A target is most effectively destroyed or neutralized by
A. firing all guns as individual pieces, as rapidly as possible
B. covering the area with sweeping fire
C. co-ordinating the fire of the entire battalion or battalions
D. firing all the guns in the battalion by platoon

The best answer multiple-choice item may be varied to require the student to: (1) select the *two* best responses from a series of possible answers, (2) indicate the *worst* response or the least desirable solution, (3) indicate both the *best* and *worst* response. All of these variations can and should be employed to measure the student's ability to form judgment and make applications of things taught.

3. *Reverse multiple choice.* The reverse multiple-choice item differs from other forms in that the student is required to choose the *poorest* or wrong response from among several correct responses.

Examples:

Directions: Each of the incomplete statements listed below is followed by several phrases. From these phrases choose the one that, when added to the statement, makes it *false. There is only one that will do this.* Place the letter of that phrase (A, B, C, etc.) in the numbered blank space to the left of the item. The first item is answered as an example.

(x) *E*... An aerial photograph can be oriented
A. with the ground
B. by shadows
C. by Swanson scale
D. with a map
E. by arrow indicating line of flight

(50) ..... In an electric circuit with capacitance
A. there is an opposition to any change in voltage
B. the current phase is affected by voltage lagging current
C. the current flowing varies with the frequency of the supply voltage
D. after initial charging, direct current will flow in the circuit
E. after initial charging, alternating current will flow in the circuit

(51) ..... In a superheterodyne receiver
A. the incoming waves are amplified and mixed with the waves from the high frequency oscillator
B. the beat frequency and intermediate frequency are mixed in the second detector
C. the mixers are introduced because of the basic principle that two different frequencies added together form a third equal to their sum
D. the intermediate frequency results from the action of the first detector
E. the second detector converts a radio frequeney to an audio frequency

(52) ..... If the Cuno oil filter on the Ford engine became clogged
A. the filter would no doubt stop turning
B. the by-pass valve would open
C. the pressure relief valve would not work
D. the filter could be taken out and cleaned

Uses, advantages, and limitations:

1. The multiple-choice item can be designed to measure effectively the student's ability to form judgments and make application of things learned. It is the most valuable of the new-type test items for this purpose.
2. It can be used to measure what one can recognize, which represents a much wider field than what one can recall.
3. It can be varied to suit many kinds of subject matter and to measure various types of achievement: command of fundamentals, formation of judgments, and so on.
4. Its scoring is entirely objective.
5. It is space consuming.
6. There is danger of including more than one response that can be marked correctly.

Points to be observed in constructing the multiple-choice test item:

1. Include at least four and preferably five, but not more than six possible responses in each item. The fewer the possible responses, the greater the possibility of guessing the correct response.
2. Include no responses that are obviously wrong. If one response is obviously wrong it might as well be left out. There should not be one correct response listed among four obviously wrong ones, for an intelligent student can answer such an item by a process of elimination. To have a test that discriminates, all possible answers must be worded in such a manner that the student must know the subject matter in order to select the correct response.
3. In constructing the items, the choice should be placed near the end of the incomplete statement. This makes for continuity of reading.
4. Avoid the inclusion of irrelevant clues to the correct response.
5. Do not make the correct response consistently longer or consistently shorter than the incorrect responses.

(To be continued)

Training the Marine

MAJOR JOHN V. SANDBERG*

Hundreds of leathernecks, the men who keep the Marine Corps planes in the air and ready to fight, are being trained as aviation machinists and metalsmiths at the Naval Air Technical Training Center, Navy Pier, Chicago, Ill.

The Marine Aviation Detachment, Navy Pier, Chicago, Ill., is commanded by Lt. Colonel Carlton Hill, USMC, a veteran of World War I, who returned to active duty again when war threatened the United States.

Major Paul Putnam, USMC, who was in charge of Marine Aviation at Wake, said in one of his reports, "Parts and assemblies have been traded from plane to plane, have been junked, stripped, rebuilt, and all but created." It is to traditions such as this that the aviation machinists and metalsmiths are given training.

The courses, whether avaition machinist or aviation metalsmith, cover a period of 21 weeks of intensive schooling both in the classroom and in the shops.

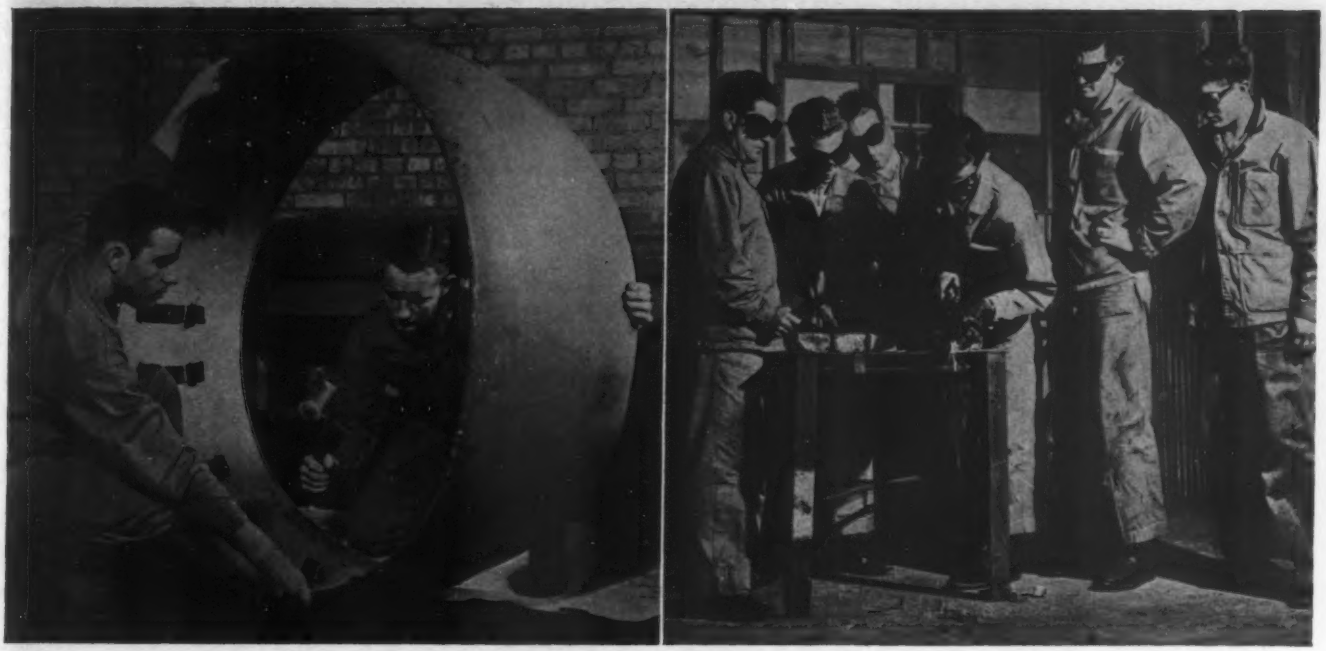
Under the guidance of expert Naval and civilian instructors the time spent is indeed not idle. A typical day includes four hours of shopwork, one and three-fourths hours in classwork and lectures by their instructors, and one and three-fourths hours for company period. During company period, the trainees drill and are taught many other things which each and every fighting man should know.

The aviation machinists are taught all that there is to be known about the mechanical parts of an airplane. A schedule is set up whereby each man receives instructions in the various aspects of aircraft mechanics.

He is first given a two weeks' basic course which indoctrinates him in the rudiments of the trade. From then he goes on to his more specialized work. He receives training in working with hand tools, and studies all parts of the landing gear,

*United States Marine Corps, Public Relations Section, Chicago, Ill.

Marines learning about guns and airplane engines — Official U. S. Marine Corps Photos



Trainees learning metalsmithing and welding — Official U. S. Marine Corps Photos

including the brakes and wheels. He is taught algebra, mathematics, mechanical drawing and blueprint reading, propeller construction, aircraft ignition, accessories, carburetors, and lubrication. Three weeks are spent in motor top overhaul and three weeks in motor assembly. The final four weeks of the training include actual line operations.

Added to this, the leathernecks are never allowed to forget that they are first and always fighting men — ready to take their places at the front line whenever called upon. They are given instructions, during the ninth, tenth, and eleventh weeks at the school in signaling. This includes wigwag, flasher, and some code work.

During the thirteenth to sixteenth week, the leathernecks receive a special course in aviation ordinance. Then, if found physically and mentally qualified, they are sent out to the range, where they receive an indoctrination course in aerial gunnery.

During this time the leathernecks also keep on with drill and physical training so that they will be in the finest physical condition for their duties wherever they may be stationed. A battery of noncommissioned officers and enlisted personnel, who are qualified instructors in the various hand-to-hand combat techniques, aid the officers with this important work.

The aviation metalsmith is taught an even more specialized type of work than the aviation machinist. He receives the two weeks' basic course also, and then covers extensively work in hand tools. A full ten weeks' course in sheet-metal work follows. During this time he is taught all types of sheet-metal work and makes his own tool kit, various funnels, and learns to patch and prepare all metalwork of an airplane. He then covers a course in welding for a period of nine weeks with the last week spent in the refinishing class.

The metalsmith, too, finds time for the signaling course, drill and physical program. The specialized work that he is in does not cover the aviation ordnance and aerial gunnery work which the machinists have the opportunity of taking.

All this work in both classes has its compensations, for upon graduation the top 25 per cent of the class are automatically made corporals and the rest of the class are advanced one rating to Private First Class. The men have a trade, which will stand them in good stead whether they stay in the Marine Corps after the war is over or return to civilian status.

There is also another advantage for a man in aviation. With the proper physical and mental make-up, he can receive flight training at one of the Naval Air stations.

Upon completion of this flight training, he will be designated a Naval Aviator, promoted to the rank of Staff Sergeant and assigned to one of the squadrons of Marine aviation.

Airplane Sheet-Metal Shop Practice

M. D. CAFFIN*

Identification and Composition of Wrought and Cast Aluminum Alloys

Aluminum is alloyed with various other metals for use in modern airplane construction. Pure aluminum is used in some instances, but because of its softness and certain other undesirable qualities that it has in pure form, it is found best to alloy it with other metals for certain parts of the planes. Some of the metals with which aluminum is alloyed for desired characteristics are copper, silicon, manganese, magnesum, and chromium.

*Scotch Plains, N. J.

Aluminum alloys are used in various forms in the manufacture of the airplane. It is *wrought, extruded, cast,* and *forged* to the shapes required. Each of these will be briefly discussed in the following paragraphs.

Wrought Alloys — Their identification and classifications.

Aluminum alloys come under two classifications, those that are strain hardened, and those that are hardened through heat-treatment. All wrought alloys are designated by a number followed by the letter S, i.e., 2s, 3s, 17s, etc.

The number discloses what the alloy is, and

the letter S signifies that it is a wrought alloy. Most of the metal in the plane is wrought. That is, it is rolled, drawn, or formed in its original fabrication at the aluminum plant.

Alloys that are strain hardened are:

2s — This is commercial pure aluminum, but is classed for convenience as an alloy. It is soft and easily workable. It is used for parts that require deep drawing and forming.

3s — An alloy of aluminum with 1¼ per cent manganese, often used for fuel and oil tanks.

52s — An alloy of aluminum with 2½ per cent magnesium and 1¼ per cent chromium. These other metals add hardness. 52s is used for fuel and oil lines.

Alloys that are heat-treated are: 14s, 17s, 24s, 25s, 51s, 53s, and 61s.

Each of these heat-treatable alloys has a particular use in one part or another on the plane, depending upon the manner in which it must be shaped by the plane manufacturer and the particular stress to which the part will be subject in the airplane. *17s and 24s* are the two most widely used wrought alloys of aluminum in current manufacture of planes.

Extrusion: This process is used for shaping T sections, Z sections, channels, and angles of a solid piece. A cylindrical ingot of aluminum is heated between 750 and 850 deg. F., and forced by a hydraulic ram through an opening in a die. The opening is the shape desired for the cross section of the finished piece.

17s, 24s, 53s, 61s are used for extrusion.

Forging: In this process of fabrication, the metal is heated to proper forging temperature and hammered, pressed, or drop forged to shape. This process is used for fittings and other structural parts that require strength.

14s, 17s, 25s, 51s, 53s, are used for forging.

Casting: Aluminum alloy castings have been found not to have the strength and shock resistance of the wrought alloys. However, castings are used for certain aircraft parts when the design of the part is such that considerable machining would be necessary to make it in any other way.

Cast alloys may have different compositions like wrought alloys. *A cast alloy is designated by a number only,* for example, 195, 214, 142, etc. *There is no letter used as in the case of the wrought alloy which has the letter S following the number.*

Corrosion: Pure aluminum is highly resistant to corrosion. However, when aluminum is alloyed with other metals its characteristics are somewhat changed, and it loses some of its resistance to corrosion.

For airplane work it is best to protect all surfaces from corrosion by painting.

Alclad: This is a trade name of the Aluminum Company of America for an aluminum alloy which is coated on both surfaces with a thin coat of very pure aluminum. Because it is pure, aluminum resists corrosion and it is not necessary to paint Alclad. The alloy used is 17s and 24s.

Scratches and nicks: Any piece of Alclad or other alloy that is scratched is rendered open to greater corroding action. *A scratched piece is unfit for aircraft work.*

Questions

Directions: If a statement is true, circle the letter T; if false, circle letter F. Fill in correct answers in the completion questions.

T F 1. Most of the airplane is made of pure aluminum.

T F 2. An alloy is a mixture of two or more metals.

T F 3. All wrought aluminum alloys are distinguished by a number such as 2, 24, 17, 195, etc.

4. Five metals alloyed with aluminum for airplane use are: ....., ..., ..., ..., ...

5. Wrought aluminum alloys come under two classifications — strain hardened and .....

6. Of the following wrought alloys, name those that are strain hardened: 17s, 2s, 24s, 3s, 25s, 52s, 61s. .....

7. Some different forms of aluminum alloys are: wrought, ..., ..., ...

T F 8. Pure aluminum is known as Alclad.

T F 9. A right-angle bend made in a brake is known as an extruded piece.

T F 10. Cast alloys are stronger than forged alloys.

T F 11. Pure aluminum does not corrode readily.

12. Alloys identified by number, such as 195, 214, 142, etc., are ..... alloys.

13. Airplane fittings and other parts requiring greater strength are usually made of ..... (type) alloys.

14. Two most widely used wrought alloys in airplane work are ..... and .....

15. In regard to corrosion, it is important that aluminum alloys be handled so as to avoid .....

Answers to Questions

1. F
2. T
3. F
4. Copper; silicon; manganese; magnesium; chromium
5. Heat-treated
6. 2s, 3s, 52s
7. Extruded; cast; and forged
8. T
9. F
10. F
11. T
12. Cast
13. Forged
14. 17s, 24s
15. Scratches

The Vocational Challenge of the War Wounded

ARTHUR JESS WILSON*

The problems of this war will be insignificant when compared to the problems of the coming peace. The consciousness of the existence of a state of war impels all human action toward the accomplishment of the single goal of self-preservation by the destruction of all the interests that would oppose it. Peace returns society and the individual to a normal life which implies an attempt to find security and betterment. The men and women in our armed forces today are fighting for their self-preservation — not in terms of the physical but in terms of human dignity. We must never lose sight of this fact for one single moment, for in a comprehension of that fact we are able to anticipate the expectations and the thoroughly justified vocational challenge of the war wounded to the society to which they shall return.

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The thousands of men who have gone and are still going to the defense of a democratic order of life believe in that order to the exclusion of an order which neglects the importance of individuality and the dignity of the individual. Therefore, there are certain obligations which the men and women in the armed forces will fix upon the order they are defending. To ignore these obligations will be fatal to the concept of a lasting peace or a functioning democracy. Let us summarize these obligations:

1. The *moral* obligation of American democracy to the war wounded. In the last war we asked the men of America to make the world safe for democracy. The democracy which they made safe had no machinery set up to take these men back as useful units. Disillusionment and moral disintegration followed in the wake of World War I. If democracy has a moral basis of existence, then it must plan a

place for its wounded and disabled defenders so that they may continue to live as a vital and contributing element in a democratic system.

2. The *political* obligation of American democracy to the war wounded. Democracy continues to live by virtue of consent rather than by coercion. The inherent strength of democratic rule arises solely from a belief of its constituents that their interests as individuals will best be considered by such rule. The fascists have directed their line of attack against such philosophic reasoning. Our armed forces today comprise much of the intellectual wealth of the country. They are educated, skilled, and interested. They will measure to a large extent the success or failure of this conflict in terms of their personal treatment by the order they defended. If they suffered vocational death on the battle front, they will look to democratic agencies to recognize them as the individual problems of a democracy, to study them as individuals, and to plan immediately for their reinstatement into some contributing branch of a democratic society. They will not accept explanations as a substitute.

3. The *economic* obligation of American democracy to the war wounded. Our President has listed *freedom from want* as one of the freedoms of man for which we, as a nation, are fighting. Idleness and neglect of security become very fertile soil for the seeds of discontent to thrive. The political fabric of any government is attached to an economic structure. Thousands of the finest citizens of this country will have sacrificed their vocational lives because of their faith in democracy. Their sacrifice will have been terrible enough. Their neglect will be unforgivable. These men and women left pleasant vocations and adequate incomes in exchange for the prospect of death. The only compensation for those who return disabled is the opportunity to return to a serious vocation which shall yield a living income.

4. The *social* obligation of American democracy to the war wounded. No matter how bitterly we deny the fact, a man's social position in his own community is dependent largely upon his economic status. This does not mean that it depends upon his wealth, but upon his economic status. Either he is successful in giving himself and his family the reasonable necessities of life, or he is unsuccessful in this objective. His social colleagues will applaud or condemn him by the dictates of this yardstick. Men seek the psychological security of applying their ability to useful purposes as well as the economic security that comes from remunerative labor. As pointed out before, it will be an intelligent and interested army of men and women who return from the battle fronts of the world. Those who have lost their precious right to work at something they love will comprise an embittered social class. They will become a thorn in the heart of democracy unless they are provided with the opportunity to orientate themselves into a new vocational life.

It is entirely possible to anticipate a tremendous problem with respect to the vocational adjustment of the returning disabled fighting men and women. Army figures reveal that 700,000 men were released from the Army this year with a medical discharge. Of this number it is estimated that 50,000 to 60,000 men will be disabled. Of this number, it is further estimated that 22,000 will be from New York State. It is important that we keep in mind that a very slight and comparatively insignificant physical injury may constitute a most serious vocational disability. As an example, a slight hand injury may be vocationally fatal to a musician. It is in this respect that the number of vocationally disabled will greatly exceed the number of physically disabled.

However, from our public defense programs we have learned two very important educational principles. They have both been derived by necessity and proved by experiment. This is usually the way many new and vitalizing principles are introduced. They are sure to pave the way to a new educational edifice in which our vocationally disabled troops can be trained for a fresh vocational life. These principles are: (1) With the correct vocational analysis, a swift and complete transfer of training is possible from one type of vocation to another. For example, a former watchmaker or watch repairer can be trained for a precision toolmaker. The basic qualities which have been trained over a period of years may be specifically applied to another vocation: there must be only a retraining in new procedures. (2) Training and retraining can take place in a concentrated period of time by means of such techniques as a well-planned syllabus, an activity program of teaching, and the incorporation of formerly learned motor skills and procedures. With 200 hours of classroom work and instruction, thousands of trainees are being sent out well equipped for skilled positions in war industry.

Under the very able leadership of Dr. Lewis A. Wilson and Oakley Furney of the New York State Education Department, a vast system of public defense courses have emerged almost overnight in every section of the state. Thousands of men and women from various walks of life — lawyers, insurance agents, salesmen, plumbers, store owners, etc. — have been placed as welders, draftsmen, machinists, etc. It has been an educational revolution with implications greater than we can at present visualize. At a recent meeting, the director of the war-training classes for the city of New York told the writer that 200,000 persons had been trained in such classes during the past year and 15,000 persons were at present in training in the city of New York. He estimated that between 500 and 1000 new students are admitted to war-training classes each week and that the monthly average for admissions is 7000 to 8000. Placement has been high. The writer, in the course of his duties, recently visited a public defense class of deaf mutes and was informed by the instructor that sixty such disabled people had been trained for machine-shop jobs *and that everyone had been placed in a good position.*

In view of these facts which have been tersely presented, the writer feels that there has been established already a working basis for a program of vocational rehabilitation for the members of the armed forces who return disabled from military duty. The writer offers the following recommendations in anticipation of this coming problem: (1) an anlysis be made of the occupations of the members of the armed forces for the purpose of determining the possibilities of a transfer of training into other vocations in the event of vocational disability; (2) a close study be made of vocational opportunities as they will probably exist at the close of the war; (3) an expansion of rehabilitation facilities and rehabilitation personnel be undertaken immediately with a view toward creating a smooth running vocational rehabilitation machinery which shall be geared to move rapidly when the call comes at the close of the war; (4) a detailed educational survey be made as to the extent of present training facilities in view of expected increased demands at the close of the war for the disabled; and (5) a series of conferences, on a systematic plan, be launched at once among leading physicians, educators, psychiatrists, psychologists, sociologists, and technicians and specialists in the field of vocational rehabilitation, with a view toward the establishment of a co-ordinated plan of vocational rehabilitation for those disabled for the cause of victory.

THE FELLOW WORTH WHILE

Do you throw in the sponge
When your team is behind,
Forget you're a man,
And say things unkind?
Or do you try twice as hard
To salvage the game,
Shouting words of encouragement,
But never of blame?

Oh, it's easy to smile,
When your team's out ahead,
And the going is smooth,
With little to dread,
But the fellow worth while,
Is the one who can grin,
When there isn't much hope,
And he's all tuckered in.

— *Leonard E. Schmidt*
Lincoln Hall Vocational School,
Lincolndale, N. Y.

Selecting Trainees at the San Bernardino Air Depot

MAJOR HOWARD R. HUTCHISON*

The major role of modern vocational educational techniques in the effort to win this highly complex mechanical war is being brilliantly demonstrated today at the San Bernardino Air Service Command in California, where some of the newest developments of technical training procedure are being effectively applied to train thousands of civilian and enlisted mechanics.

The Air Service Command (ASC) of the United States Army Air Forces is now grooming a force of 250,000 civilian mechanics plus the largest percentage of the two million enlisted men in the Army Air Forces for the job of "Keeping 'Em Flying." The civilian component alone will be the largest centrally controlled industrial organization in the world — bigger than General Motors, bigger than the Ford Empire.

To maintain and repair the nation's war planes is the job of ASC. By the time a plane has had one thousand hours in the air, it has already required more man hours of maintenance work than were necessary to build it originally at the plant. There must be ten ASC mechanics and service specialists to every flyer who is kept in the air, it is estimated. To keep Uncle Sam's eagles of war in the skies, the Air Service Command is necessarily much the biggest, numerically, of the nine Army Air Forces commands.

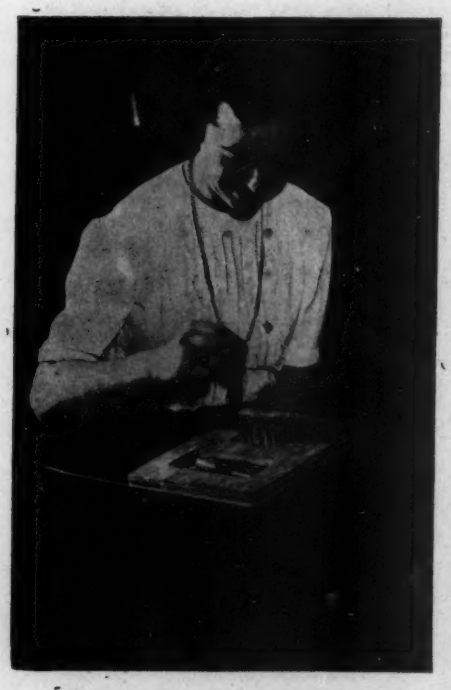
To prepare for victory, America has had to train millions of skilled mechanics, specialists, and workers in technical fields. This is an industrial war which is tremendously expanding the nation's industrial potentialities. Many of the needed workers have had to be developed from strictly raw, inexperienced material.

With our war-production industries having already absorbed so many qualified mechanics, the ASC's most vital task has been to recruit and train its required huge complement of specialists. To accomplish this, an ingenious modern technique of industrial education has been devised and applied at the San Bernardino Army Air Depot in California.

Among the newest of a group of major air depots established by the ASC in the continental United States, San Bernardino Air Service Command directs the operations of numerous subdepots and installations throughout southern California, Arizona, and parts of Nevada and New Mexico. This huge multimillion dollar industrial-military establishment is located on an 1800-acre tract with numerous buildings now completed and more being built.

Established near the great aircraft manufacturing centers of southern California, the San Bernardino Air Service Command is reportedly designed as a permanent postwar installation for both military and commercial aviation purposes. At this vast establishment has been developed a process of technical training which the Air Service Command is employing at several other depots and which is now under the discriminating scrutiny of numerous war-production industries. Distinctive feature of the depot's processing technique is a unique "selection system" of training to ascertain the specialty of aircraft mechanics for which each employee recruit is best fitted. The process is recognized by today's industrial world as a vital contribution to the technique of grooming specialized industrial talent for the work of operating and maintaining modern machines and other duties.

San Bernardino Air Service Command's effective training program and its curriculum were perfected under the direction of Major Homer Fetty, depot technical training officer and former vocational educational director of the Los Angeles County Schools. Before joining the Army, Major Fetty organized industrial training courses in dozens of public schools to train skilled specialists for the aircraft manufacturing and shipbuilding plants of Los Angeles. Today, those same plants, so many of whose workers were trained under his direction, are sending delegations to Major Fetty's depot at San Bernardino to study techniques which they might adopt to expedite their own production and training methods.



Taking a digital dexterity test to determine manual skill

Complexity of ASC's problem is indicated by the fact that each depot must train specialists to handle 256 different model airplanes, 157 different model engines, and more than 1000 different accessories. The San Bernardino depot alone now handles 80,000 different supply items, and will soon be disposing of many thousands more.

Recruits at San Bernardino are first put through a battery of aptitude tests especially adapted to predict the success of workers in specific fields in the repair and maintenance of aircraft. Because the work done by a mechanic in each field of an air depot is so limited and so specialized, neither the individual test nor batteries of tests were able to stratify the workers for all of the separate specialties. Different combinations have been worked out for each field. Research work is now progressing to select and standardize a battery which will cover each specific field.

Different tests being used include the Otis Intelligence Test, the Bennett Mechanic Comprehension Test, the Minnesota Paper Form Board Test, the O'Connor Finger Dexterity Test, the Wisconsin Lathe Test, the Drake Accuracy Test, and the Snellen and Yaeger Vision Test, employed individually and in different combinations.

Each recruit is then presented a four-hour "orientation lecture" in which is fully outlined the entire picture of ASC responsibilities and operations. Each recruit is then given a series of four-hour "experiences" in each 19 specialties of aircraft mechanics. These include carburetors, aircraft disassembly, ignition, engines, fabric and leather, hydraulics, instruments, machine shop, paint and dope, drafting, woodshop, Army-Navy standards, sheet metal, welding, wire cable, fuel and oil

*Public Relations Officer, Air Corps, Depot Control Area, San Bernardino, Calif.

systems, aircraft electricians, brakes and measurements.

These tryout tests are based on actual manual experience on typical sample work projects taken directly from the field in which the worker is being tested. Showing how authentic experiences are used to register the worker's relative dexterity, in the field of "fuel and oil systems" where the handling of aircraft tubing is the major activity, a sample tryout experience was developed in which each worker cuts, bends, flares, and fits a piece of tubing, according to given directions. This is exactly the kind of work that all specialists in "fuel and oil systems" must be able to perform. With the assumption that the recruits coming into this experience lack previous mechanical experience, the instructor gives a detailed explanation of the proper use of the tools involved, presents a simple but comprehensive explanation of the job, and performs a complete demonstration of the job before the worker is called upon to execute it.

In the performance of each experience, the worker is rated by his instructor on specific steps in the job and upon the worker's probable ability to take successful training and to perform effectively in the particular field. After completing all the experiences, the worker interviews a counselor and is asked to express three preferences. On the basis of his actual performances in these four-hour tryouts, his results in the battery of tests, and his personal choice, each worker is assigned to a specialty and given an intensive specialized course lasting from two to four months.

For the first time in industrial history a broad introductory eclectic program has been applied to the training of mechanical talent. Many advantages accrue from giving newcomers such a complete picture of the new work they are entering. Industrial foremen have normally been plagued by worker unrest. Workers have a persistent penchant for "greener fields far away." The pay-rollee's universal desire seems to have been to try to find a more glamorous or lucrative job than his own. San Bernardino Air Service Command's new system gives the rookie a chance to try everything before choosing his specialty. That enables him to select what he prefers and to ascertain empirically the work best fitted to his talents and his knowledge. Having first tried all the jobs, he will not dream later of what he thinks he has missed. That means he will be more satisfied, more efficient, and more useful.

Another substantial advantage of this procedure is that these manipulative experiences teach the worker the fundamental nomenclature, tool recognition and use, and foundational skills and knowledge required in each of the specialties. The worker thus becomes endowed with an over-all view of the complete operation in which he is to play a vital part. This improves his work within the limited field to which he eventually is assigned and, by indoctrinating him with a total picture, remains a permanent asset to his morale.

Actual advanced training in the specialty assigned lasts normally for a period of 12 weeks. Instructors have from five to ten trainees in a group, which makes possible a maximum of individual attention to each worker. Training procedure is almost 100 per cent the practical shop method, with the classroom being used only when it is a faster method of teaching than that available in the shop. San Bernardino's training shops use only the most modern equipment valued in excess of a million dollars.

The training course is made up of a series of jobs directly developing those specific skills needed in the worker's given specialty in the production shops. Each worker is allowed to progress at his own rate and incentives are given for the more rapid advancement of each trainee.

Termination of the training period comes when in the instructor's opinion, the worker has achieved sufficient knowledge and skill sucessfully to pass a trade level test for the "mechanic helper" status. When the worker does actually pass that test he is ready for placement in productive work. If there is no demand at that time for his services in production work, the worker is retained in the training department and given advanced study until he is called by the production department.

This upgrade training may be continued until the worker is able to pass the trade test in the junior mechanic level.

ASC has two major fields of training. Maintenance, that is doing actual work on aircraft and equipment, occupies two thirds of all employees at an air depot.

Supply and clerical constitutes the second branch of the training. People are schooled to handle items of all different descriptions and purposes, ranging from paper clips to huge Pratt and Whitney engines. The training program for supply consists of specific job training for shipping clerks, storekeepers, receiving clerks, stock record clerks, inspectors, mail file and record clerks, purchasing and contracting personnel, and inventory clerks and other miscellaneous clerical positions.

For the hundreds of supervisors who oversee phases of the air depot's maintenance and clerical work special training is provided. A *supervisor* has a small group of people under him. Since most of these supervisors had no previous experience in handling people and directing work, it is a major problem to prepare supervisorial talent for an establishment that has mushroomed so rapidly.

An intensive *supervisory training program* with a minimum of 52 hours has been developed by the Air Service Command at the San Bernardino Air Depot. The course's three divisions are job management, problems of handling employees, and how to instruct. Details covered include how to plan, set up, direct, and control an operating organization; how to handle the shop problems as they arise, including personnel problems, grievances,

Trainees in sheet-metal work are receiving instructions on bending a stiffener on folding machine

Trainees learn the intricacies of a parachute

and introducing new workers to new jobs; how to do *on-the-job* training efficiently. Stressed throughout this course are methods of handling men, methods of training, and safety factors. This advanced training program has proved to be an effective aid in the solution of the supervisory dilemma.

San Bernardino's training program also includes an extensive teacher-training program for its several hundred instructors. It is the fountainhead of an educational network which has special off-reservation classes and upgrade training programs in many educational institutions and subdepots through the four states of the San Bernardino Air Depot control area.

Perhaps a typical illustration of reactions by amateurs who are indoctrinated into the mechanical world by this air depot's procedure is the story of a woman who was much dismayed when she observed that she was to do "horrid mechanical work." Prevailed upon to give it a try, she soon found that she liked it better than any other work that she had ever done. She grew to so excel at the "horrid mechanical work" that, in time, she was made an instructor to teach this art.

More than 85 per cent of the civilian trainees are women, with the others consisting chiefly of elderly men and men not physically qualified for military service. This work does not exempt a man from military service, and men eligible for the draft are not enrolled. The majority of these workers have had no previous mechanical experience, and are developed from the beginning. Of the women, most of them are servicemen's wives, mothers or sisters determined to contribute their utmost to the earliest possible victory, and so bring home their men in a minimum of time.

One worker is motivated for the earliest possible release of his father-in-law, a Japanese prisoner of war. In one class of recruits was Mrs. Inez Barnett and her granddaughter, Mrs. Pearl Ulick. Mrs. Fern Terrell, a former trapeze artist, is doing excellent work as an aircraft electrician. John Pierpont Morgan, a Negro, wears the Order of the Purple Heart and half a dozen other medals; he has had 27 years of Army service.

San Bernardino Aid Depot has found that the physically handicapped can often perform splendidly. One woman with only one hand worked with such adroitness that for three weeks her supervisor failed to notice her loss. Cripples who can't work have been found to excel at benchwork. Cripples are found to take special pains, and if they're ambitious enough not to quit altogether, they are often more exacting and have better records as a group than unhandicapped people. Major Fetty, the training officer, said, "San Bernardino Air Depot likes to have the handicapped because they have proved themselves successful, because we must get all the recruits we can, and because the war effort must use everybody. We feel that America owes these people an opportunity to show their worth. They comprise about 3 per cent of our total. While many industries won't use them, we will and do with excellent results."

Knottiest problem of ASC's training program at San Bernardino is getting the people to train. This is primarily a recruiting problem, to make known the need and to familiarize more people with the fine training provided. Temporarily handicapping the program is a housing shortage which complicates the problem of bringing in people from outside areas. That makes necessary a finer combing of the home field, which also must man the war-production industries of southern California, one of America's leading war-production centers.

Unskilled civilian workers are all hired by the United States Civil Service Commission at $100 a month, plus overtime, and routed through the base civilian personnel office into the training division. They may work up through successive steps into better positions and higher pay scales.

A mechanic learner in sheet-metal work learning to repair a wing section of a plane

ASC's experience is teaching some of the most poignant social lessons of the war. It is driving home the fact that many women have exceptional mechanical aptitude and can operate ponderous and complex machinery, sometimes more skillfully than men. They also become expert in the repair of delicate instruments, with which

*War D
Washington,

instrument flight through fog and overcast is accomplished. War is teaching that the old are still fit to work, and work wonderfully well. War teaches that the handicapped can play a constructive role in society. War teaches that the seemingly uneducated can be schooled to operate machinery and repair aircraft, the loss of which would otherwise delay victory. War teaches that nearly every man and woman can be used, and we are using thousands of them. Many sociological thinkers believe that the social effect of these lessons that we are learning today may be more lasting than we now imagine.

Not only is the Air Service Command forging an air weapon which is expected to be the major tool of victory, but it is laying the foundation for the future of all American aviation. America's Army Air Forces have created the need for gigantic aircraft factories. Tremendous technical strides have been made. Innumerable fields and hangars have been constructed. Myriads of flyers trained for war will subsequently make tomorrow an *age for the air*.

In its technical training progress, the ASC is evolving the basis for postwar processes for training the millions of mechanical specialists who will keep the airplanes of peace in the skies of the postwar world.

ARE YOU PREPARED?

TOM DIAMOND*

Every man who is physically fit has something the Army needs.

If, in addition to physical fitness, he has certain trade skills he is in the happy position of being able to fit into a number of special jobs which have to be done in the Army.

Of course, every soldier must learn to fight, but the fighting has to be done with extremely intricate machines. These machines have to be serviced, maintained, and repaired, which necessitates having soldiers who can fight and at the same time keep their fighting equipment in working condition.

If in the midst of a battle a piece of equipment fails, the lives of many may depend upon the skill of someone who can get it back into service quickly. Obviously, this individual becomes an extremely important member of the group.

As an example of this one need only consider the question of communications. If the Air Forces, Ground Forces, Service Forces, and Navy are to work as a team, they must be in constant touch with one another. If this contact is broken, they are compelled to work as separate units with the result that the efficiency of the armed forces is reduced.

In order to assure this contact, the Army must have men with experience in radio repair and radio operation; men with experience in maintaining telephone and telegraph lines and equipment; and men who can send and receive messages by using flags, lights, or other means of signaling. If you have any of these skills, the Signal Corps will welcome you as a valuable addition to its team.

We find also that guns and rifles must be serviced and repaired if they are to function effectively when they are needed. In battle there is no time to pull a gun out of the line and send it back to the base when it ceases to send its missiles against the enemy. It is out of commission for the duration of the battle, or it can be repaired and resume its effectiveness quickly, if the man behind it has the necessary skill to make minor repairs or adjustments. Here again the lives of many may depend upon this skill. The type of man who can meet these emergencies is one who has skill in using metalworking hand tools and who is familiar with benchwork practice in a machine shop.

Then, too, the modern Army moves on wheels. These wheels are turned by gasoline and Diesel engines. If the engines fail, the supply of food, ammunition, or men is not delivered at the place and time that it is needed. The lack of food or water could starve our Army into submission; the lack of ammunition could make it impossible for the Army to carry out its plan of battle; and the lack of men at a particular spot at a given time could spell disaster for those who are depending upon them. The man who can diagnose trouble in these engines when it appears and who can make the necessary adjustments to assure its functioning may be the one who makes the difference between victory and defeat. Any skill you have in auto mechanics will increase your value to the Army.

Most of our communications and engines, as well as countless other pieces of equipment used by the Army are activated by electricity. In view of this, men with experience in dealing with the problems of electricity as they appear in these fields have a skill which is invaluable to the Army. Electricians, from whatever field of electricity enter the Army with a greater range of opportunity than those who are merely physically fit.

Then the Army needs what they term "utility repairmen." These men should have some skill in woodworking, metalworking, plumbing, and electrical work. They too, are in the happy position of being of special value to the Army and are likely to be placed in positions where their skills can be used to advantage.

It may be that the prospective inductee is in a job now in which he has acquired or is acquiring some of these skills. If not, the suggestion is made that he attend one of the many classes being held in our public schools. You may not become an all-round tradesman in the time you have left before induction, but you can certainly acquire one or more skills and thereby increase your value to your country.

Young men who are inducted are likely to feel that since America is fighting a war, and since they are being called to help do the job, they want to give their country the maximum service of which they are capable. If they are to do this, they must concern themselves with preparing themselves for the task. In view of all this, young men

We are fighting a war!
Get ready!
Prepare!

*War Department, Headquarters, Services of Supply, Washington, D. C.

APPLIED WISDOM

Attack disagreeable as well as agreeable jobs willingly.
Tell the world of your joys — keep the griefs to yourself.
Cultivate friendliness to all.
Look upon yourself as no wiser than others.
Ascribe unworthy motives to no one.
Learn that scolding and nagging others will not cover your own failures.
Sophistries cannot quiet the conscience of a man who is honest with himself.
Venting your anger on an innocent person is a mark of a mean character.
The success of others should arouse your joy — not envy.
Make others happy, even if you are unhappy.

The core curriculum is defined as that part of the organized education of youth which pupils are required to pursue because of its crucial, frequent, and important need for proper social living.

— *Raymond B. McHenry*

Source Materials for the Printing Instructor

HAROLD H. KIRK*

The war is taking a heavy toll on the experienced teacher. Every city and town is feeling the loss of these men who have left their teaching jobs to defend their country. In their places are coming new instructors. Many of these men will be needing helpful reference and source materials so that they may carry on their printing classes.

The following books will be of much aid to the inexperienced man who finds himself before a group of youngsters for the first time. Of the many textbooks on the market today none are adequate alone to meet the many phases of the graphic arts. Thus the following are presented as a group of four which will go a long way toward providing a complete picture of the graphic arts for use in junior and senior high school printing classes:

Printing and the Allied Trades, R. Randolph Karch (New York: Pitman Publishing Corporation), rev. ed., 1939.

Exploring the Graphic Arts, Anthony Marinaccio and Burl N. Osburn (Scranton, Pa.: International Textbook Company, 1942).

The Student's History of Printing, Merritt W. Haynes (New York: McGraw-Hill Book Company, 1930).

The Printing Trades and Their Workers, Florence E. Clark (Scranton, Pa.: International Textbook Company), rev. ed., 1939.

It would seem that the field of printing could be well covered using the above books as texts and reference reading. In the first, the technical field is well covered and in the second the general and informational material is given about all the related areas. The third named book gives a brief but accurate picture of the historical, while the last named gives in detail the occupational information on printing and the allied trades and their workers.

Reference Reading for the New Instructor

In the previous paragraphs four sources of material were listed which should be supplied in sufficient quantity for the largest class. It will simplify the teaching immensely to have enough copies for each student.

For further reading and self-improvement the following bibliography is compiled and recommended to the new instructor:

The Printed Book, Harry G. Aldus (Cambridge, England: Cambridge University Press), rev. ed., 1941, by John Carter and E. A. Crutchly.

The Book, Douglas C. McMurtrie (New York: Covici-Friede, 1937).

Behind the Type, Life Story of Frederic W. Goudy, Bernard Lewis (Pittsburgh, Pa.: Carnegie Institute of Technology, 1941).

Elements of Composition, I.T.U. Lessons, Unit I, Lessons 1 to 10, International Typographical Union, Indianapolis, Ind., 1938.

Seventy Books About Book-Making, Hellmut Lehmann-Haupt (New York: Columbia University Press, 1941).

The Power of Print—and Men, Thomas Dreier (Brooklyn, N. Y.: Mergenthaler Linotype Company, 1936).

Composition and Presswork, Arthur J. Mansfield (Arlington, Mass.: The Arlington News), rev. ed., 1942.

Typologia, Frederic W. Goudy (Berkeley and Los Angeles, Calif.: University of California Press, 1940).

Arithmetic for Printers, J. Woodward Auble (Peoria, Ill.: The Manual Arts Press, 1940).

Newspaper Makeup, John E. Allen (New York: Harper and Brothers, 1936).

Printing Papers, William Bond Wheelwright (Chicago, Ill.: The University of Chicago Press, 1936).

Franklin, The Apostle of Modern Times, Bernard Fay (Boston, Mass.: Little, Brown and Company, 1929).

A History of the Printed Book, The Dolphin, Lawrence C. Wroth (New York: The Limited Editions Club, 1938).

Type Lore, J. L. Frazier (Chicago, Ill.: The Inland Printer, 1925).

Historical Sketch of Bookbinding as an Art, Merric K. Dutton (Norwood, Mass.: The Holliston Mills, Inc., 1926).

A Journal of the Making of Books, The Dolphin, Edith Diehl (New York: Limited Editions Club, 1935).

Modern Bookbinding, A Survey and a Prospect, Douglas Leighton (London, England: Oxford University Press, 1935).

The Industrialization of American Bookbinding, Joseph Rogers (Germany: Gutenberg Jahrbuch, 1938).

Bookbinding and the Care of Books, Douglas C. Cockerell (New York and London: Isaac Pitman and Sons, 1937).

Elbert Hubbard of East Aurora, Felix Shay (New York: William H. Wise and Company, 1926).

In Quest of the Perfect Book, William Dana Orcutt (Boston, Mass.: Little, Brown and Company, 1926).

The Practice of Presswork, Craig R. Spicer (Chicago, Ill.: The Inland Printer Company, 1931).

Platen Press Work, Ralph W. Polk (Peoria, Ill.: Manual Arts Press, 1931).

The Colonial Printer, Lawrence C. Wroth (Portland, Me.: Southworth-Anthoesen Press, 1938).

Bookbinding, John J. Pleger (Chicago, Ill.: The Inland Printer, 1924).

Papermaking, Dard Hunter (New York: Alfred A. Knopf, Inc., 1943).

Proofreading and Copy Preparation, Joseph Lasky (New York: Mentor Press, 360 West 23rd Street, 1941).

Auxiliary and Supplementary Reading for the Student Reference Shelf

Besides the more advanced and technical references suggested above, other books for the school library and for the boys and girls in the student clubs are given. Many of these are interesting and delightful stories of the traditions and folklore of the printing, bookmaking, and journalistic fields. Many of these are stories of the tramp printer, the printer's devil, and the life around the small newspaper shop.

Letters to a Printer's Devil, R. T. Porte (Salt Lake City, Utah: Porte Publishing Company, 1924).

Extra! Extra! Joseph Henry Jackson and Scott Newhall (New York: MacMillan Company, 1940).

Stickfuls, Irvin S. Cobb (New York: George H. Doran Company, 1923).

At the Sign of the Golden Compass, Eric P. Kelly (New York: MacMillan Company, 1938).

Printers' Devil, Adam Allen (New York: MacMillan Company, 1939).

Benjamin Franklin, Printer, John Clyde Oswald (New York: Doubleday, Page and Company, 1917).

Wings for Words, A Story of John Gutenberg, Douglas C. McMurtrie (New York: Rand McNally and Company, 1940).

Benjamin Franklin, A Biography in Woodcuts, Charles Turzak (New York: Covici-Friede, 1935).

The Student Editor, by James W. Mann (New York: MacMillan Company, 1939).

Handicrafts and Hobby References

We have been fortunate in the past few years to have had a grand and worthwhile assortment of books published on the handicrafts and related trades. Many of these books are so well illustrated that hobbycraft can be continued at home. Every student club should have available at least one of these volumes in each of the fields mentioned.

General Printing, Cleeton and Pitkin (Bloomington, Ill.: McKnight and McKnight, 1941).

General Bookbinding, Chris Groneman (Bloomington, Ill.: McKnight and McKnight, 1942).

General Leathercraft, Raymond Cherry

*Langley Jr. High School, Washington, D. C.

(Bloomington, Ill.: McKnight and McKnight, 1940).

Meet Mr. Hyphen, Edward N. Teall (Chicago, Ill.: The Inland Printer).

Papermaking in the Classroom, Dard Hunter (Peoria, Ill.: Manual Arts Press, 1931).

Let's Bind a Book, Guy A. Pratt (Milwaukee, Wis.: Bruce Publishing Company, 1940).

Block Printing for the School, William S. Rice (Milwaukee, Wis.: Bruce Publishing Company, 1930).

Block Printing Craft, R. W. Perry (Peoria, Ill.: Manual Arts Press, 1938).

Forest, Trees, and Woods, Francis E. Tustison (Peoria, Ill.: Manual Arts Press, 1936).

The Binding of Books, Perry and Baab (Peoria, Ill.: Manual Arts Press, 1940).

The Graphic Arts, Johnson and Newkirk (New York: The MacMillan Company, 1942).

Practical Signs and Posterwork for Beginners, H. P. Harshbarger (Bloomington, Ill.: McKnight and McKnight, 1939).

Bookbinding, F. R. Smith (New York and London: Isaac Pitman and Sons, 1937).

Silkscreen Printing Process, Biegeleisen and Busenbark (Chicago, Ill.: The Inland Printer).

Bookbinding for Schools, J. S. Hewitt-Bates (Peoria, Ill.: Manual Arts Press, 1935).

Bookbinding Made Easy, Lee M. Klinefelter (Milwaukee, Wis.: Bruce Publishing Company, 1938).

Preservation of Leather Bookbindings, U. S. Leaflet 69, R. W. Frey and F. P. Veitch, Government Printing Office, 1930.

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It is hoped that in this bibliography some helpful references will be found which will aid in the teaching of printing and the many allied trades and crafts. The instructor of today is quite fortunate in having an excellent selection of source materials. There need be no educational ceiling for the instructor who wishes to learn about the graphic arts, and teach in the way it ought to be taught.

Outline of General-Shop Course

ALAN B. PAWELEK*

The general-shop course is designed to give the pupil a foundation for future work in the more specialized courses offered by the vocational department. Practical experience in wood, metals, and electricity is to be offered along with related information which will be of avocational as well as vocational value.

The general-shop program is designed for all ninth-grade students. Whether they have had other shop courses or not is immaterial.

The class shall meet five days per week for a period of 45 minutes daily each day. This program will continue for twenty weeks (one semester). After credit is earned for this length of time, the student will continue in the second semester taking general shop where the operations and informational units will be progressively more difficult. Earned credit for the year will enable the student to continue in the specialized shop courses of the vocational department.

Because of the absence of home and outside work in these courses, only half credit (2½ hours) will be given per semester.

Course Organization: General-shop work in both the first and second semester is divided into five divisions, namely, woodwork, sheet metal, bench metal, metalcraft, and electricity.

It is suggested that the students will be divided into five groups of the size which can be accommodated by the various stations. Each group will make at least two assigned projects in each division; thus, there will be a constant rotation which will make for good shop use and organization. If the assigned projects are finished by any boy before the end of the term, he will be allowed to work on a project of his own choosing provided it is in his capabilities as determined by the instructor.

Class Organization: In order to maintain a high standard of class discipline and organization a student foreman of each unit of instruction will be appointed along with a general-shop superintendent. These boys will care for routine matters such as station cleanup, general safety factors, dispensing of supplies, keys, maintenance, etc., as outlined later in this article. It is emphasized strongly, however, that these matters are to be personally supervised by the instructor, and under no conditions should the student be allowed to take roll or enter grades on cards.

No materials or supplies will be given without first consulting the instructor. All materials are to be furnished free to the boy except that needed for coppersmithing and extra jobs done after the core projects are completed.

General Method of Instruction: At the beginning of each term the instructor shall give related information concerning the materials with which the student will work. Topics such as lumbering, iron, electricity, and sheet metal will be lectured on and carried over into class discussions. Notebooks, bought by the students for this purpose, will be used for taking notes and making necessary drawings. If individual job sheets are not available the procedures and drawings of the core projects shall be put on the board and copied by the pupil. Thus, the student may have his notebook practically completed as to related information and job sheets during the first week or two of class organization.

In keeping with the general purposes of the course, that is, to provide practical experience in a variety of mediums, each student will receive guidance in each of the five units. The instruction will be both group and individualized. Each assigned or core project should be discussed and demonstrated during the regular class time. The demonstrations should begin early and continue throughout the semester until each job unit is covered.

Pupil-Personnel Organization: Past experience has shown the desirability of a pupil-personnel organization in the general shop. Such an organization not only permits the student to assume responsibility for the care and operation of the physical setup, which is important in his training, but also relieves the teacher of many routine matters, thus freeing him for more important tasks. It is felt that good organization and pupil participation is as important as developing a technique for presenting subject matter.

The organization outline which follows is merely suggestive and is offered as a guide to the beginning teacher and pupils.

General-Shop Organization in General

1. Students will enter the shop and go immediately to their assigned benches. At this time the safety foreman will unlock drawers and toolroom, the tool boys will put on aprons, and the general foreman will check the shop as to equipment, toolroom, and general condition. He shall report any irregularities to the instructor.

2. After the tardy signal has been rung, roll call will be taken by the instructor, announcements made, and excuses signed. Class demonstrations and discussions shall be carried on at this time.

3. At the time when the preliminary matters have been completed, pupils shall

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remove sweaters or coats, roll sleeves above elbows, and put on their aprons. All students must wear aprons while working in the shop. As the tool boys take their stations the class will line up in single file and check out necessary tools and then proceed to work.

4. Five minutes before the dismissal bell, the cleanup order shall be given by the instructor. The boys will then: (*a*) clean their respective stations; (*b*) check in all tools received in their name; (*c*) put aprons away in proper drawer; (*d*) sit at desks assigned to them.

These latter operations should be under direct supervision of the instructor assisted by the unit foreman and the shop superintendent. After the cleanup period is over the shop superintendent will make a tour of inspection around the shop, reporting all irregularities to the instructor.

At the sound of the dismissal bell the class will file out of the room under the guidance of the instructor at the exit. The instructor will remain there until the next class enters.

Special Assignments: The following special assignments shall be made in each class to be terminated by the instructor as he sees fit: shop superintendent; bench-metal foreman; sheet-metal foreman; woodwork foreman; metalcraft foreman; electricity foreman; safety foreman; and toolroom boys.

The duties of the shop superintendent are:

1. Check shop for any irregularities as to cleanliness, proper arrangement of tools and equipment, missing tools, and general arrangement at the beginning and end of each class period. A report should be made to the instructor.
2. Assist supervision at cleanup period.
3. Keep an up-to-date list of unit foremen at all times.
4. Assist instructor in class supervision in the event of callers, supervisors, or visitors.
5. Set a good example of conduct for the rest of the class.
6. Be alert at all times for violation of safe practices.

The duties of the foremen in charge of the various units are:

1. Keep an up-to-date list of boys working in his unit, so that he knows at all times if there is room for additional workers.
2. Be alert for violations of safe practices at all times.
3. Make sure stations are clean at end of each period.
4. Make sure all tools used at his station are properly used and checked into toolroom.
5. Report any missing tools or irregularities to the shop superintendent or instructor.
6. Dispense materials and supplies to his unit making sure each item is first consented to by the instructor.
7. Set a good example of conduct to the rest of the class.

The duties of the safety foreman are:

1. Unlock drawers and toolroom at beginning of period.
2. See that all boys have sweaters and coats removed and sleeves rolled above elbows.
3. Light gas furnaces when necessary.
4. Watch for any boy who may work without an apron.
5. Be alert at all times for violations of safe practices. Report these to instructor.
6. Apply simple first aid to injuries after reporting to instructor.
7. Check the first-aid cabinet every day for cleanliness and adequate supplies.
8. Keep soap containers filled and a supply of towels on rack.
9. Lock drawers at the end of period after all aprons and projects are put away.
10. Set a good example of conduct to the rest of the class.

There will be two boys assigned to toolroom duty at all times. One new boy will be appointed each Monday, so that there will always be an experienced boy working with an inexperienced one. Both boys will be on duty at the beginning and end of each class period. The boy who has been in the toolroom will be allowed to work in the shop after the first rush is over. He will return to the *crib* a minute before cleanup time. The boy left in will spend his time cleaning, checking, and repairing the tools. The latter operation shall not be done without the instructor's consent.

Tool Checking Procedure:

1. Boys will form a line on the right side of the door.
2. Each boy will write his name and tools he wishes to check out on pad issued for this purpose.
3. One tool boy will check list while the other one will get the tools required.
4. When returning tools, each boy will lay them on the shelf until they are checked off by the tool boy. The second boy will return them to their proper place in the cabinets.
5. When all tools have been properly returned and checked, the check list will be placed on the instructor's desk.

GENERAL-SHOP PROJECTS

First Semester Course

Project	*Material*
Doorstop	Pine 13/16 by 1½ by 5 in.
Vise jaws	Pine 13/16 by 3 by 7¼ in.
Dividers	⅛ by ¾ by 5½-in. band iron
Hammer heads	½ by ½ by 4¼-in. square iron
Hammer handle	3/16-in. wire
Square scoop	I. C. tin (bright)
Cookie cutter	I. C. tin (bright)
Ash tray	26-ga. sheet steel
Bowl	26-ga. sheet copper — 18 ga. 6 by 6 in.
Extension cord	Wire, plug, socket
Splices	No. 18 bell wire
Circuits	No. 18 bell wire

Second-Semester Course

Mallet head	3 by 3 by 6-in. birch (square)
Mallet handle	¾ by 1 by 10-in. birch
Calipers (inside)	⅛ by ¾ by 5½-in. band iron
Calipers (outside)	⅛ by ¾ by 6-in. band iron
Metal box	26-ga. sheet metal
Spice scoop	I. C. tin (bright) 4¾ by 4¼ in.

EXTRA PROJECTS

For Either First- or Second-Semester Courses

Project	*Material*
Corner shelf	½-in. basswood
Window stick	¾-in. basswood
Handkerchief box	½-in. basswood
Trowel	16-ga. sheet steel
	⅛ by ½-in. band iron
Lamp	⅛ by ¾-in. band iron
	¾-in. birch
Plaque	26-ga. sheet copper
Ring	No. 16 silver wire
Paper knife	16-ga. sheet copper

INTERVIEWING THE PROSPECTIVE STUDENT

BENJAMIN J. NOVAK*

Shortly after the Murrell Dobbins Vocational School was opened in February, 1938, a program of selecting students was introduced.[1] The purpose of the selection is to insure good student material, to help guide students into curriculums suited to their interests and capacities, and also to provide an unbiased basis for choosing from the applicants who usually outnumber the facilities at our command. Selection is made by a committee of teachers on the basis of previous school record, intelligence ratings, mechanical aptitude, arithmetic achievement test scores, and an interview. The effectiveness of the procedure has been investigated in a small scale study,[2] and more extensive research is planned.

A unique feature in the selective process is the utilization of each shop teacher to interview candidates for admission to his trade. The obvious purpose is to have the shop teacher assist in determining the fitness of the applicant. It has become the custom in recent years to think of inter-

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[1] "The Selection of Students," *Phi Delta Kappan*, April, 1940, pp. 390–391.

[2] "How Effective Is the Selection of Students for Vocational Schools?", *Education*, May, 1941, pp. 533–537.

viewing as a specialized function to be performed only by counselors and other specially trained persons. Although it is realized that the use of the interview technique by the untrained is fraught with danger, it has been found that the shop teacher can obtain from the interview valuable information concerning individuals which is revealed imperfectly, if at all, by existing testing devices. Obviously, limitations of time and skill on the part of the teachers prevent the type of interview employed by the experienced counselor.

In conjuction with the interview a numerical rating scale is used, the teacher assigning a rating of 1 to an applicant estimated to show unusual promise. A rating of 2 indicates a good risk, 3 fair, 4 poor, and 5 very poor. An applicant securing a rating of 4 or 5 is usually reinterviewed by someone else in order to obtain an independent opinion. The interview sheet, shown in Figure 1, was devised to serve as a guide.

In an effort to determine whether the interview ratings given by the shop teachers were indicative of later success of the students, a set of ratings was compared with grades made in the shop.[3] The study was too limited to show significant results. It seemed a common tendency for the interview ratings to be generally higher than the shop marks. Three times as many students who earned the best shop marks received an interview rating of 1, as compared to those who failed in shopwork.

In this study, an attempt was made to determine how consistent shop teachers are in rating applicants by asking different instructors of the same trade to assign ratings to the same applicant, and also by asking the same teacher to rate the same person at different times. Such studies are by no means new. Viteles[4] quotes an investigation by Hollingworth in which experienced salesmen interviewed 57 applicants for sales positions, ranking them in order of probable success. There was a wide variation in the ranking. Other research of a similar nature has been reported.

In this study 14 shop teachers[5] participated as interviewers. The following trades were represented by these instructors: (1) commercial art, (2) child care, (3) machine construction, (4) machine design, (5) printing, (6) sheet metal, (7) welding.

Students who desire admission to the Dobbins Vocational School report for testing and interviewing either in May or November, and are admitted at the start of the school term following. On these testing days, school is dismissed in the afternoon, releasing all teachers for the work. Part of the interviews obtained during the testing period of November 10, 1941, and some of those obtained in May, 1942, were used.

The distribution of interview ratings by two teachers grading the same applicant is shown in the combined scattergram comprising Table I. There were 230 cases in all. It will be remembered that the ratings range from 1 to 5, with 1 indicating an excellent risk and 5 the opposite extreme.

In order to interpret the scatter diagram in Table I more intelligently, Table II is presented.

In half of the cases both interviewers gave the same rating. In about 41 per cent of the cases there was a variation of one between the two interviewers. In only one instance did the interviewers disagree by as much as 3 intervals. The implication would seem to be that there is some uniformity in rating by the various teachers for the same applicant. It should be noted, however, that the entire scale covers only 5 intervals, hence the amount of possible variation is limited from the start.

When the applicants who were accepted reported to classes at the start of the term following their rating, some of the teachers were asked to interview them for a second time. There was no opportunity for reference to the previous rating. Most of the reinterviewing was done during the first week of the term. This prevented any appreciable influence upon the rating which might result if the teacher acquired impressions from personal acquaintance with the students. In about half the cases the interviewing teacher had no contact with the students at all, since they were in classes conducted by other teachers. The time interval between the interviews was either two or four months. Unfortunately for this part of the study, no time allotment was possible. The interviewers were forced to work during their regular class time, with consequent distraction and haste.

Table I. Interview Ratings Assigned to Applicants by Two Different Shop Teachers

First Teacher Ratings	*Second Teacer Ratings*					*No. Cases*
	1	*2*	*3*	*4*	*5*	
5					3	3
4		4	6	6		16
3	4	25	32	6		67
2	21	55	23	6		105
1	21	14	3	1		39
Total						230

Table II. Variation Between Ratings Assigned to Same Applicant by Different Interviewers

	No. of Cases	*Per Cent of Total*
Same rating by both interviewers	117	50.9
Difference of 1 between interviewers	95	41.3
Difference of 2 between interviewers	17	7.4
Difference of 3 between interviewers	1	.4
Difference of 4 between interviewers	0	
Totals	230	100.0

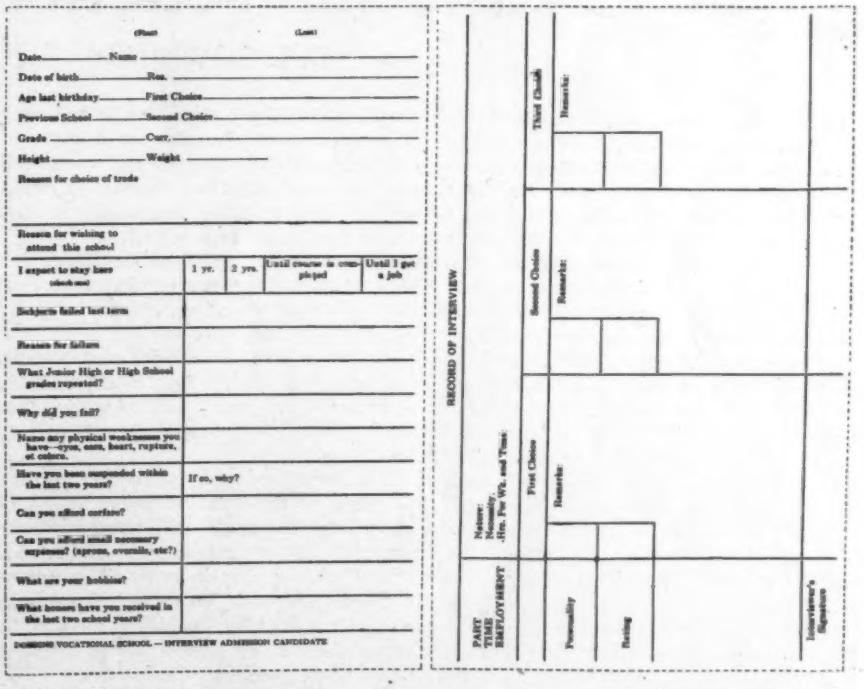
(Last) (First)
Date Name
Date of birth Res.
Age last birthday First Choice
Previous School Second Choice
Grade Curr.
Height Weight
Reason for choice of trade
Reason for wishing to attend this school
I expect to stay here (check one) | 1 yr. | 2 yrs. | Until course is completed | Until I get a job
Subjects failed last term
Reason for failure
What Junior High or High School grades repeated?
Why did you fail?
Name any physical weaknesses you have—eyes, ears, heart, rupture, et cetera.
Have you been suspended within the last two years? If so, why?
Can you attend curfew?
Can you afford small necessary expenses? (aprons, overalls, etc?)
What are your hobbies?
What honors have you received in the last two school years?
DOBBINS VOCATIONAL SCHOOL — INTERVIEW ADMISSION CANDIDATE
RECORD OF INTERVIEW
Name: Normality: Hrs. Per Wk. and Time:
PART TIME EMPLOYMENT
First Choice
Second Choice
Third Choice
Remarks:
Personality
Rating
Interviewer's Signature

Fig. 1. Interview sheet. Front of card is shown at the left. This is to be filled in by the applicant. The back is to be filled in by the interviewer

[3] *Ibid.*, p. 534, Table III.

[4] Morris S. Viteles, *Industrial Psychology*, Norton & Co., 1932, p. 173.

[5] The study could not have been undertaken had it not been for the generous cooperation of the following: Earl Boyer, Harry Brodsky, Wm. Brogan, Joseph Crudden, Wayne Gosser, Ruy Granzow, James Henderson, Edward Hille, Jacob Perkins, Paul Shearer, Alida Shinn, Dorothy Schaefer, Joseph Smith.

The distribution of ratings assigned by the same interviewer to the same applicant at two different times is shown in Table III.

It is surprising to note that there was little difference between the distributions of the ratings given by the same interviewer at different times, and by two different interviewers. It is likely that the haste of the second interview influenced the accuracy of the ratings.

Viteles[6] states that interviewing can be improved in accuracy by a brief training period, guides such as rating scales, standardization of proceedings, and the like. It is probable that experience also may have a beneficial influence. Of the teachers who cooperated in this study, only a part had been in the school to participate in the testing and interviewing program since its inception in 1938. An inspection of the interview ratings which were made by several of the more experienced teachers revealed a higher degree of reliability than was shown in the ratings of the less experienced instructors.

The interview procedure has the value of obtaining valuable information about students which can be utilized for purposes of guidance. The active participation by all the shop teachers serves the important function of developing a faculty consciousness of guidance. The teachers are encouraged to feel that guidance is a general responsibility, particularly in a vocational school. The shop teacher who sees a student for three hours daily has an unparalleled opportunity to note his behavior manifestations and vocational inclinations. Often the alert teacher can serve as a *scout* in referring problems to the counselor, and makes suggestions based upon his intimate daily contact with the student that are invaluable to the guidance specialist.

The validity of assigning numerical ratings to candidates for admission by the various teachers is open to conjecture. Additional comprehensive studies comparing these ratings with subsequent success in the school and on the job after training are indicated. Since time permits a teacher to devote an average of only about 10 or 15 minutes to each interview, the procedure can by no means be thorough. In our system of selection, the ratings in themselves are not determining factors in deciding the acceptability of applicants for admission. It would not seem unwise, therefore, to retain them, pending the findings of further research.

[6]Morris S. Viteles, *op. cit.*, pp. 178–179.

Table III. Interview Ratings Assigned to Applicants by the Same Teacher at Two Different Times

First Rating	*Second Rating*					*No. Cases*
	1	*2*	*3*	*4*	*5*	
5						
4				8	1	9
3	2	11	28	3		44
2	4	34	18	6		62
1	13	8	4	3		28
Total						143

A summary of the variations is presented in Table IV.

Table IV. Variation Between Ratings Assigned to Applicants by Same Interviewer

	No. of Cases	*Per Cent of Total*
Same rating each interview	83	58.0
Difference of 1 between interviews	45	31.5
Difference of 2 between interviews	12	8.4
Difference of 3 between interviews	3	2.1
Difference of 4 between interviews	0	
Total	143	100.0

Professional In-Service Improvement of Vocational Teachers in Ohio

D. L. DOWNING*

In this study an attempt was made to discover the influences and activities which, in the opinion of trade and industry teachers in Ohio, contributed most to their professional improvement after they began their teaching experiences. Attention was also directed toward discovering the professional background of these Ohio teachers and the in-service professional improvement work they have actually undertaken. Data were secured from 291 vocational teachers. It was proposed and justified that the criteria of teacher-recognized values of improvement practices be accepted as valid and as the best criteria yet available. The data revealed that, of the all-day unit trade teachers reporting, 88 per cent had taught 15 years or less in vocational schools of Ohio and that more than 50 per cent had taught five years or less. This indicates that at the present time there is a broad field for service in teacher improvement. The same situation exists in regard to teachers of evening trade extension classes in which classification 75 per cent of those reporting claimed six years of experience or less.

Nearly 60 per cent of the vocational teachers reporting had taught in other schools. This teaching was mainly in high school and junior high school.

The permanent vocational certificate was held by only 25 per cent of those reporting, the eight-year vocational professional by only 6.9 per cent, and the four-year vocational provisional by 18.8 per cent, and the temporary or renewal vocational certificate was held by the remaining teachers amounting to approximately one half of the group.

The men reported instruction by the foreman as the most common means of entry into their trade, with apprenticeship, pickup, helper experience, and trade school courses next in order. The women entered their trade by means of a special course in school, by the pickup method, by apprenticeship, by experiences as a helper, or by being taught by the foreman.

Sixty-three per cent of vocational teachers had 12 years or less of trade experience. The average trade experience was ten years and seven months.

In spite of the fact that working at the trade was rated as highest in value of all improvement activities, only 23 cases were reported of taking leave to work at the trade, and only 91 teachers reported working at the trade during summer vacations during the past five years. These two types of contacts account for only 39 per cent of the teachers reporting. The average vocational teacher in Ohio, it seems, is probably somewhat negligent in returning to work at his trade.

College and university course work, other than trade improvement courses taken by trade teachers, has shown decided increases during the past three years.

One hundred fifty-one teachers reported that they held degrees when beginning to teach and at the time of the survey there were 185 teachers who held a total of 229 degrees or diplomas. The baccalaureate degree was held most often. Most of the degrees had been earned in Ohio colleges

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INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

John J. Metz, Editor

Postwar Planning

One hears much about postwar planning for the schools but much of this planning is couched in such general terms that it can fit almost any type of work in existence now.

Probably the best kind of postwar planning for the teacher hinges on the old tried-and-true scheme of doing the very best in his classes right now, keeping a sharp lookout for what other teachers are offering that is in advance of what is being offered in his own classes; studying local, and if possible, national industrial progress so as to keep abreast of modern production methods and equipment; taking an interest in new discoveries and inventions; getting acquainted with local sources of the various materials in use in the modern school shop; studying OPA requirements and getting acquainted with the nearest OPA officials so that needed equipment and materials may be obtained in the shortest possible time and with the least amount of trouble; studying the possibilities of obtaining usable scrap from factories; preparing projects that use materials that can be obtained from the students or from local industry; learning more about the services that the school may offer to alleviate present-day man-power shortages; and best of all, reviewing again and again, with the idea of improving it if possible, his own methods of instruction, instructional material, and outlines of instruction.

Any instructor who follows this procedure will be absolutely in step when the time for postwar adjustments can be prognasticated with more definiteness than can be done at present.

What is more, his students will have been instructed in such a way that they may most profitably take advantage of any changes that will have to be made in the school-shop courses designed for the postwar period.

The procedure outlined is simply the old method of doing the job in hand to the best of one's ability, and in keeping one's mind flexible enough to adopt and adapt methods whenever conditions require a change.

Those Precious Man-Hours

One of the most important factors to be considered at the opening of the new school year is how to inaugurate a more effective safety program. Industrial accidents are mounting due, no doubt, to the fact that workers of every age and degree of skill are not at work in the war-production plants.

The students who are now in high school will, in but a few years, enter the Army or they will take their place beside these workers in the defense industries. In any case, safety habits should be part of the equipment which they acquired at school.

There are some, of course, who are firm in the belief that the European war is practically over, and that Japan is virtually licked right now. If that were true, there would still be the need for emphasizing safety instruction in the school shop. Many teachers, no doubt, are taking their safety instruction very seriously, but safety on the whole is hardly given as much attention as it ought to get. It ought to be part of every lesson, and it ought to be placed before the student as dramatically and as strikingly as possible.

But shop safety, that is, safety in handling tools, machines, and supplies, ought not be the only type of safety which should be taught to the student. Recent reports of the National Safety Council state that 1942 took a death toll of 18,500 workers who were killed while on the job, and 29,000 were killed while away from their work, on the streets and highways, in public places, and at home.

During the same period of time, 90,000 workers were permanently disabled through off-the-job accidents, while another 2,300,000 workers were temporarily kept from their jobs for a longer or shorter period because of off-the-job accidents. The total time lost because of these accidents amounted to 2,160,000,000 man-hours.

In these days of man shortage, the loss of such a gigantic number of man-hours means something. Without counting the worker's monetary loss, or the pain, suffering, and anxiety that went with the nonfatal accidents, one can get a conception of what the time loss meant when one considers that it would have sufficed to produce 12,600 bombers.

If then, on-the-job and off-the-job accidents exact such a terrific toll from the workers of the country, should safety education mean something to the school, and can the shop teachers do something about it?

There is but one answer. For the school year 1943–1944 a better and more intensive school-shop program of safety instruction is an absolute necessity.

Vocational Education and Preinduction Training

The War Department and the U. S. Office of Education have just issued a new booklet on preinduction training which is especially directed to the vocational schools, vocational departments, and trade schools. It is War Department Bulletin — P.I.T. 330 and is obtainable from the U. S. Government Printing Office, Washington, D. C.

The booket points out that since this is a specialists' war, vocational education is in a strategic position to give the student a foundation of understanding and skill before he is called into the army.

To further aid the teacher, supplementary bulletins will be issued shortly. Each of these will deal with an occupational area and list various army jobs in this particular field. Vocational teachers can then decide how they can rearrange their courses so as best to dovetail their efforts into the pressing needs of our country at war.

The bulletin points out that while such courses as patternmaking, cabinetmaking, plumbing, and the like, do not as a rule provide training which prepares specifically for army jobs, nevertheless they do serve as a basis for postinduction training, and they do develop skills which also appear in a variety of army jobs.

A table appears in the booklet showing what application can be made of specific vocational courses in developing skills needed in army training. There also are some suggestions for long-term and short-term training courses of various kinds, as are also suggestions as to how existing programs may be modified so as to best fit in with this preinduction program.

Since this bulletin is specially addressed to the vocational teachers, every instructor in this field should at once write for his copy. The need is there and the schools will want to do their part.

It is to be hoped, however, that a similar bulletin will be issued shortly, outlining what the many industrial-arts teachers can do to prepare their students in a similar way, so as to streamline preinduction work still more, since the industrial arts can and do lay the foundation for the vocational courses, as the vocational courses are now to lay a foundation for entry into the army.

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and universities. Many of the vocational teachers reporting had decided to earn a B.S. degree in vocational education even when already holding some other degree. An equal number of teachers had decided to earn the M.S. degree in vocational education. Two teachers wanted to earn the Ph.D. degree.

Summer vacations were generally spent by vocational teachers in a manner that would contribute to their teaching effectiveness.

Curriculum construction and development of various other curriculum materials have received a great deal of attention from Ohio vocational teachers. One hundred sixty-seven teachers reported that they had engaged in this activity in the past five years. This activity is of considerable importance to effective trade education in vocational schools, and is a valuable means of improving teachers in service.

Writing for publication was reported by 41 persons. Magazine articles were most frequently reported, but texts and instruction books were also produced.

One hundred fifty-four vocational teachers reported that they had taught in evening trade extension schools. One hundred thirty-five of these teachers reported that they had derived benefit from these experiences, while 19 teachers reported that they had derived no benefit or had been harmed for all-day unit-trade school teaching.

Summer teaching was of less importance to vocational teachers, only 35 reporting this experience. Most of this teaching was done in summer high school.

Civic and community experience was reported quite generally. The activities were widely varied in nature.

Professional organizations were well supported by all-day unit-trade teachers. Forty-four per cent of these teachers were members of the National Education Association, 71 per cent belonged to the American Vocational Association, 73 per cent to the Ohio Education Association, and 82 per cent to the Ohio Vocational Association. Of the teachers of evening trade extension classes and continuation classes, there were 14 per cent who were members of the National Education Association. Twenty-five per cent were members of the American Vocational Association, 28 per cent belonged to the Ohio Education Association, and 50 per cent to the Ohio Vocational Association.

Membership in honorary organizations or professional fraternities was not frequently reported.

Ninety-one vocational teachers reported that they had belonged to labor organizations at some time. Sixty teachers retained their memberships and 33 reported that they attended meetings frequently.

A lengthy list of magazines was recorded as taken and read. Of the magazines reported the *A.V.A. Journal and News Bulletin* led the list with 81 readers. Other magazines taken and read by ten or more of the teachers reporting were *American Machinist, American Teacher,* INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, *Inland Printer, Machinery, Modern Machine Shop, N.E.A. Journal, Ohio Schools, Shop Mechanics,* and shop science magazines.

Influences listed as stimulating improvement beyond the minimum required level were given by 77 of the Ohio vocational teachers. One hundred eighteen influences were mentioned by these 77 teachers, many of the teachers emphasizing the same kinds of items. These influences, in descending order, were: to secure advancement, 31.4 per cent; to keep up with the trade, 27 per cent; interest in improving, 10 per cent; to secure degrees, 9 per cent; to secure better salary, 9 per cent; writing because of demands and requests, 4 per cent; research, 3 per cent; to help in employing students and co-ordination, 2 per cent; and to gain prestige as teacher, 2 per cent. The first five of these influences constitute over 87 per cent of the reports made as to influences which had stimulated teacher improvement most strongly. Three other influences which stimulated the teacher to self-improvement were secured by personal interviews by the author. They are: suggestions from fellow faculty members, suggestions and encouragement by the vocational teacher improvement staff, the University of Toledo plan for curriculum revision.

The encouragement and assistance given by members of the vocational teacher improvement staff consisted of 22 definite ways in which the members of the staff had been of service to teachers of trade and industrial subjects. These services are worthy of consideration in that they illustrate specific kinds of help that are continuously available to vocational teachers. These consist of encouragement, assistance, and advice in relation to vocational surveys, curriculum revision, faculty meetings, instructional materials, teaching methods, every day problems, theories of vocational education, programs of university study, values of trade contacts, supervision practices in other schools, planning research studies, developing teaching units and progress charts, knowledge of the objectives of trade teaching and securing needed information.

The University of Toledo plan of curriculum revision was pointed to as a most useful and fundamental way in which to accomplish two things of great importance; namely, to develop needed revision of curricular materials and to improve teachers in service by assigning them to curricular work under conditions which permit their full time to be devoted to the class. While this method of improving teachers in service may not be available to all vocational schools in Ohio, it deserves the careful consideration of those schools that are able to undertake it.

From the data secured, it seems that the 12 improvement practices most favored by Ohio vocational teachers, on the basis of actual experience as well as opinion, are the following which account for approximately three fourths of the recommendations made by the teachers themselves relative to improvement procedures: working at the trade; professional Smith-Hughes teacher improvement courses; reading, home study, trade manuals, pamphlets, magazines; taking university courses in general education; making trade and industrial contacts; job inspection and factory visits; curriculum construction; observing the work of good teachers; working toward a degree; conventions, group meetings, exhibits; professional contacts (helping hand from faculty members); personal contacts with workers, foremen, and superintendents.

Working at the trade is a means by which vocational teachers can keep up with developments in their occupational field. For the teachers who have been away from their trade for some time it affords a very desirable way of securing occupational improvement, and hence improvement in one's ability to teach the trade effectively.

Professional Smith-Hughes teacher improvement courses refer to the courses that are given by the teacher trainers as requisite for certification and upgrading of vocational teachers. Judged by the high ranking they received by the Ohio vocational teachers they should be maintained as one of the methods of teacher improvement open to all Ohio vocational teachers.

Reading in one's trade field or in literature related to the teaching of that work corresponds to the type of improvement a teacher of other kinds of subject matter than trade courses must continually engage in if he is not to get rusty in his subject matter knowledge. For the vocational teacher such reading and home study would very likely be found in professional and trade journals, trade manuals, pamphlets and magazines originating with trade organizations, industrial organizations, and other producers of specialized technical literatures related to industrial or occupational processes, materials and developments. These activities may be regarded as the best means of self-improvement. They should not be neglected by any good vocational teacher.

University courses deserve all the recognition they have been receiving in Ohio as factors for the improvement of teachers of trade and industrial subjects. Even courses in general education have a bearing upon the improvement of vocational

teachers inasmuch as any extension of one's general information makes an individual a broader-gauge person, personally more worth while and better able to guide his students in relation to the social and civic affairs of the day. Working toward a degree by vocational teachers should be encouraged without a doubt, but in the process other values or necessities of vocational teacher improvement must not be overlooked.

The making of trade and industrial contacts including the inspection of on-going industrial tasks, and factory visits are avenues of continuous improvement open to any vocational teacher. Ohio teachers seem to approve these visits, contacts, and inspections as a means of keeping themselves up with current developments in their occupational fields. Principals of vocational schools and supervisors should encourage these means of teacher improvement and provide arrangements to facilitate them wherever possible.

The high value in the way of vocational teacher improvement which is derived from work in curriculum construction has already been emphasized with reference to the University of Toledo plan. This form of activity stands seventh on the list of recommended improvement practices suggested by Ohio teachers.

Observing the work of good teachers is next on the list of suggestions for teacher improvement practices. This method of teacher improvement is well recognized in the work of general education in our public schools. Many school systems provide visiting days for members of the elementary and secondary school staff. It might be well that principals and supervisors of vocational education could adopt this suggestion for the vocational teacher by providing similar visiting days for teachers in the trade and industrial work of the vocational schools.

Working toward a degree is recognized by vocational teachers as having definite value toward one's improvement as a teacher. Work for the attainment of degrees should not be allowed to interfere with the regular teaching duties, either in the way of extension courses or campus evening courses, but within proper limits should be recognized as a highly desirable form of teacher improvement.

Ohio vocational teachers seem to be prevented from attending conventions and group meetings and from inspecting various kinds of exhibits pertaining to their field of work. Conferences and meetings as a means of improvement are reported to be utilized extensively in the fields of vocational agriculture and vocational home economics and there is no reason why they cannot be made similarly valuable in the field of trade and industrial education.

Contacts with other members of a school faculty are emphasized as a means by which vocational teachers can and do improve their own practices. There is no question but that we are continually learning from our daily contacts with other teachers. Teachers with greater skill and longer experience have almost daily opportunity to lend a helping hand to their fellows especially to the new recruits to the profession. Administrators and supervisors should build up a spirit of cooperation that will facilitate this interchange of assistance on the part of their staff members.

Personal contacts with workers, foremen, and superintendents seem to be kept alive by Ohio vocational teachers and are placed by them as being of assistance in their improvement as teachers. Such contacts would contribute to placement of young workers. They would also reveal the effectiveness of the education such young workers have received and would give information on changes in processes or working conditions, and would contribute knowledge of conditions in the trade. Good teachers will plan to maintain such contacts as one of many ways of keeping themselves up to date on matters of importance in their occupational fields. The local foremen's club is a good beginning in this direction.

Research and experimental teaching need to be encouraged in Ohio, it seems. While these items combined received only 1.42 per cent of the recommendations made as to methods of teacher improvement they have proved fruitful as a means of teacher improvement in other fields of education. It also appears that better objective means for the measurement of results of vocational teaching are needed.

Keeping in contact with students and in touch with graduates should be encouraged on the part of the vocational teacher. Principals and vocational teachers can do much in that way to promote the welfare of students and keep the school in close contact with industry and the needs of young workers. These contacts will promote teacher efficiency by causing the teacher to be aware of the industrial demands for which they must be trained if their product is to find satisfaction in the eyes of the employers. This kind of contact is stimulated by the reports required by the Ohio State Department. The more the responsibility assumed by individual teachers in making it complete and accurate the more effective will be his work.

Certain kinds of observation may have a relation to teacher improvement provided the observation is related to the trade which the teacher is teaching. For one teaching in an aeronautical school, keeping in force his pilot's certificate and his engineer and airplane certificate on a *hobby* basis might serve several excellent values in the way of teacher improvement.

Recommendations

(1) It is recommended that vocational teachers be required to contact their trade for at least three months of continuous work before the permanent vocational certificate is issued. (2) It would seem desirable to require that a teacher who holds a permanent vocational certificate be required to validate it by returning to his trade for at least three months in each five years, this requirement to continue indefinitely. (3) It is recommended that it be made mandatory that the courses in every vocational school in Ohio be revised every five years, preferably at the rate of one fifth of each course per year. (4) It is recommended that the vocational school teacher consider very carefully the advantages that will accrue to him by working toward a degree. If it appears that he will be able to earn a degree within a reasonable length of time and with the expenditure of a reasonable amount of effort, he should work toward that goal. (5) Teachers should be encouraged to write books, articles and miscellaneous materials for publication. Members of the faculty of the vocational school where there are individuals teaching who have contributed to trade literature, seem actively to have identified themselves with the writers. (6) Teaching of evening trade extension classes by all-day unit-trade teachers should be encouraged, taking reasonable care, however, that the teacher's schedule is not overloaded. (7) It is recommended that a teacher's self-inventory blank be developed for Ohio and that each teacher be furnished a copy for preservation in his own files.

ROAMIN' GALLEYS

(When pi means more than 3.1416)
We take the stick within our hand
And set the type to beat the band.
With fingers deft, we space the line
Hoping to be done on time.
We tie the job, then pull a proof,
To see if now our work has "Oomph."
Then on the stone, we use the chase,
To hold the job within its place.
With quoin and key and furniture,
We lock up every character.
The stock is cut to proper size,
And now to press we turn our eyes.
The rollers inked, the guides are spaced,
The grippers moved, the sheet is placed.
When all is set, we get the cue.
To print the job, then start anew.
Type is set by guys like me
Who cannot tell a Q from P,
And even though I work with zest,
At pieing type, I'm still the best.

— *Garfield Burnham**

*High School, Liberty, N. Y.

Problems and Projects

TEACHING AIDS AND DEVICES

CHARLES H. SECHREST
Teacher of Industrial Arts
Ferry School, and Directing Teacher
Wayne University
Detroit, Mich.

Figure 1 shows several aids that may be used in teaching plumbing work. Mounted on the display board in the background are two compression faucets that have had a section removed with a hack saw to show the working parts inside of them. If a little less than half of the faucet is cut off, the valve and packing nut can be screwed into place and the valve can be operated so that it will open and close. Other common fittings such as a union, nipple, T, cap, and plug are mounted on the board and the names of each fitting have been typewritten on paper and pasted under each fitting. On the right-hand side of Figure 1 a drain trap is shown that has had a section of it removed to show how it looks inside. The cleanout plug can be screwed into place if a little less than half of the drain trap is removed. The faucet in the center of Figure 1 has been mounted on a block of wood. This makes it easier for pupils to handle it when taking it apart. Window-shade drawings of a faucet, a drain trap, and a flushing tank may be used with these aids and devices to teach plumbing work. A window shade drawing of a compression faucet was shown and how it may be made was described in a previous article which appeared on page 401 of the November, 1942, issue of this magazine.

In Figures 2, 3, and 4 are shown some aids and devices for teaching electrical work. It has been found that by mounting transformers, bells, buzzers, and push buttons on small blocks of wood, they may be kept in good condition for classroom use for a long while. See Figure 2. Binding post clips may be mounted directly on the bells, buzzers, and transformers. Then, when the pupils use the equipment the connections may be made quickly without wearing out screws or losing nuts. Screw eyes may be driven into the blocks of wood so that they may be hung in place as shown in Figure 3.

The two display boards, Figure 4, are also used as an aid in teaching electrical work. The top display board contains the common kinds of covered electric wire such as rubber-covered wire, cotton-rubber covered wire, and

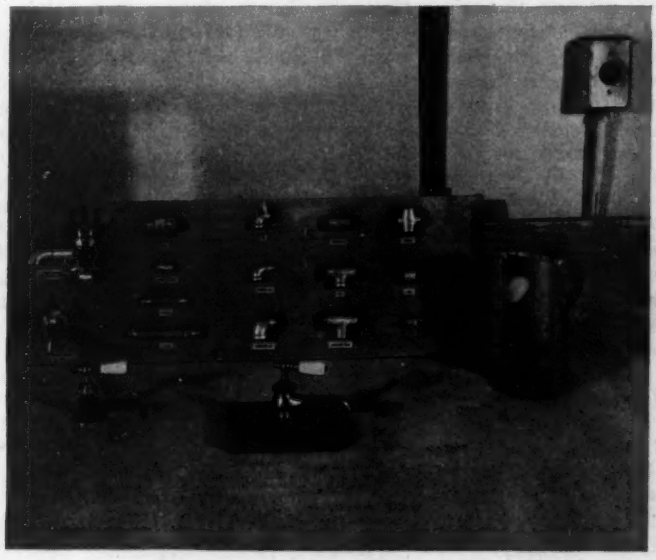


Fig. 1

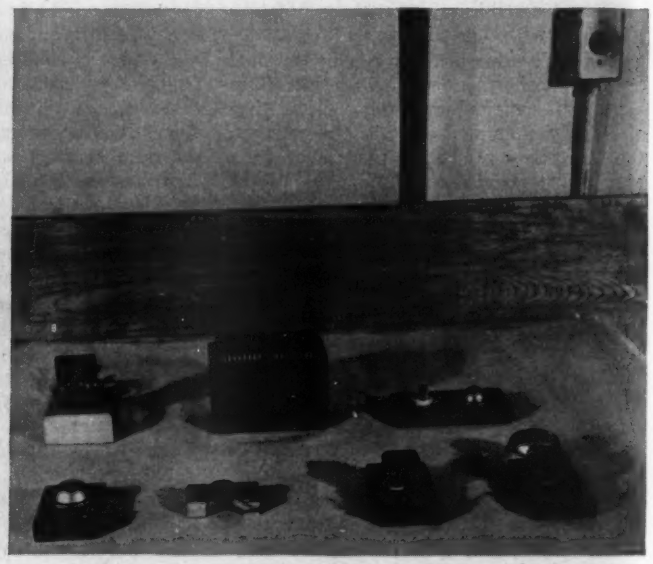


Fig. 2

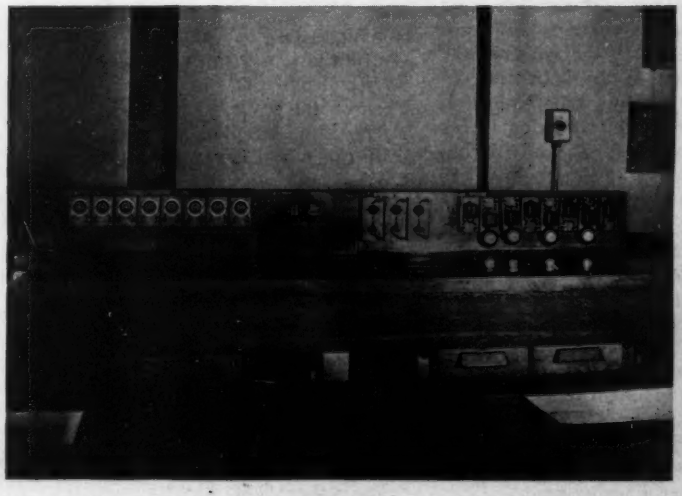


Fig. 3

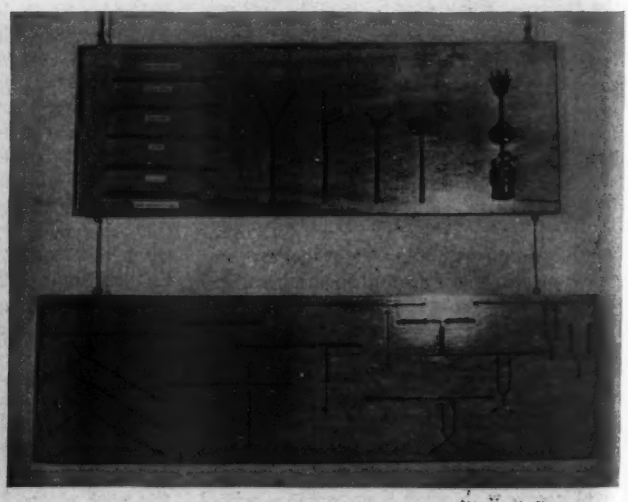


Fig. 4

silk-rubber covered wire. The board also shows how to tie an Underwriter's knot and how to assemble a lamp socket. The bottom display board shows a step-by-step procedure for making a Western Union splice, a branch tap splice, and a pigtail splice. Window-shade drawings of equipment such as a doorbell, push button, dry cell, and a simple circuit may be used with all of these aids and devices to teach electrical work.

A DRAWING TABLE FOR THE GENERAL SHOP

ROBERT P. JENSEN
Kansas State Teachers College
Emporia, Kans.

A change of equipment is required when the old unit woodworking shop is transformed into a general comprehensive shop where several units are taught at the same time. This type of general shop arrangement is necessary in small schools where unit shops representing separate fields of work are too expensive. Drawing is one of the necessary units which should be offered.

The drawing table shown herewith accommodates six pupils. The cost of the materials used in the construction of this table is less than the cost of one single conventional type table. One or more units might be used to take care of the desired number of pupils in the planning and drawing work.

A drawing table of this type must be sturdy. The rigidity of this table is due to its bolted construction and angle-iron braces. A stool 29 in. high is the correct height for the average high school pupil. The height of the table shown is such that the pupil may draw while seated on the stool or while he is in a standing position.

VISUAL AIDS IN AVIATION TRAINING

JACK LAMBERT
New York, N. Y.

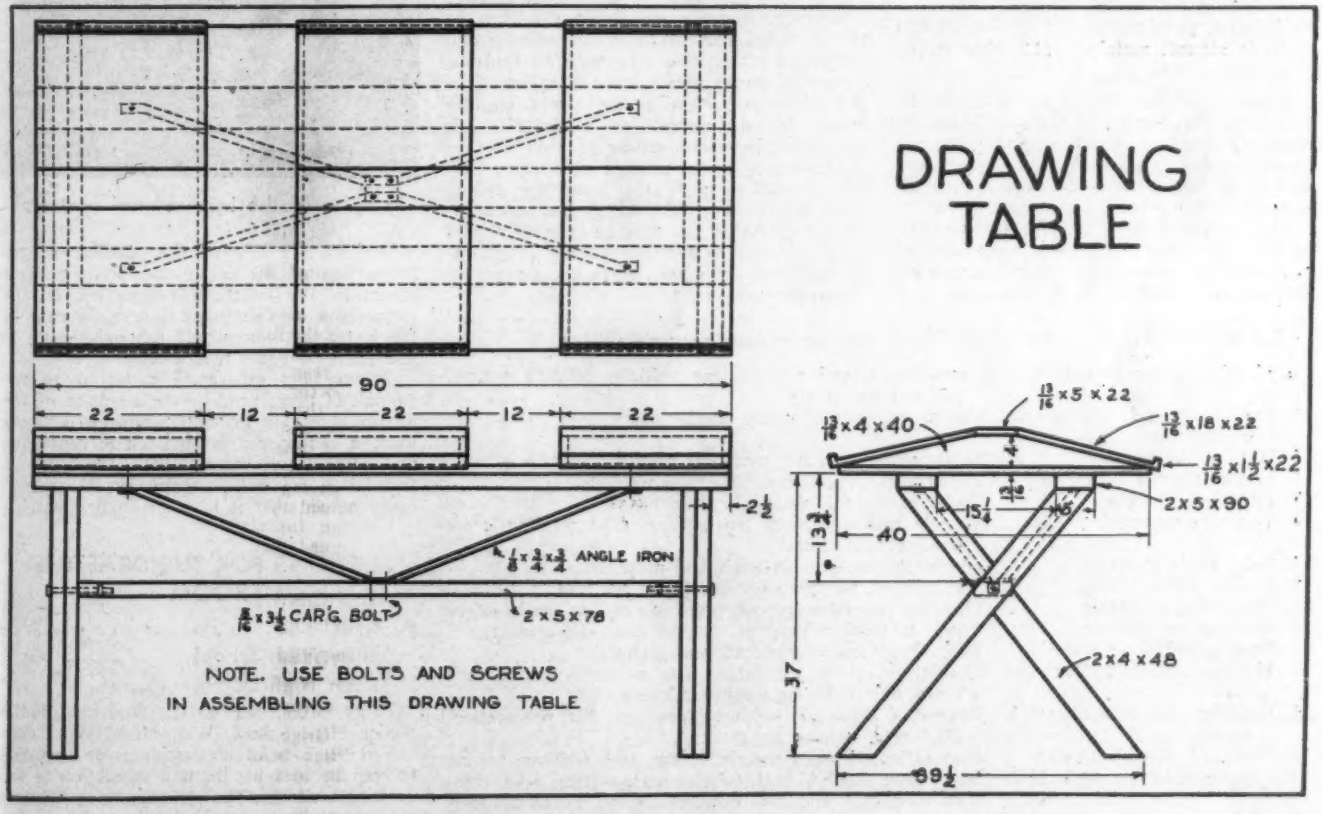
In ordinary times, the process of training for vocation proceeds at a pace consonant with thoroughness and efficiency. In time of a national emergency when the government itself looks to the vocational instructor for help in meeting the country's need for special mechanical skills, the cry is not alone for thoroughness and efficiency, but also for maximum speed in training.

This is particularly true in the field of aviation and in aviation mechanics, in which schools and colleges of various types have taken the lead. Not only the air forces need thousands of trained mechanics, but industrial war production faces a similar mechanics' training problem which involves vitally the factor of time.

To a great extent the solution has been found in *visualization* — slide films (or film strips) — which are proving their value in shortening instruction periods in the elementary stages. No attempt is being made by vocational training schools to train aviation mechanics with the films alone. But the pictures have proved their ability to give the beginning student a more speedy over-all view of the basic elements of flying, aircraft construction, and plane repair as preparation for the work to be presented by the instructor in classroom and workshop. The films lay a broad educational foundation for eventual specialization in any one of the various phases of ground service, permitting a greater proportion of time for practical training.

Visual aids prepared by the Jam Handy Picture Service, Inc.

The preflight pilot training slide films available, and being used for this speedup process are based upon the ground school material of



Drawing table designed by Robert P. Jensen

Pictures help speed up elementary aviation training

the Civilian Pilot Training Program, checked and approved by the Civilian Pilot Training Service of The Civil Aeronautics Administration. Then there are additional, correlated slide-film kit sets covering various departments of aviation *mechanics*. These picture programs cover:

a) Preflight pilot training	(24	film strips)
b) Oxyacetylene welding	(15	film strips)
c) Aircraft engine mechanics	(24	film strips)
d) Aircraft mechanics (service)	(24	film strips)
e) Aviation metalsmiths	(8	film strips)
f) Basic aircraft metal skills	(11	film strips)

Films are of the discussional type, that is, each individual picture on the strip bears explanatory wording amplifying the point the picture makes. Films may be stopped and held at any point for elaboration by the instructor or for general discussion.

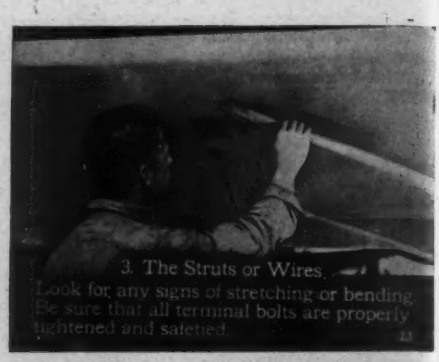
The average number of individual pictures on each film strip is 70. Facts are visualized by means of photographs, diagrams, graphs, sketches, and exhibits. Each film strip, as a rule, provides the material for one elementary lesson.

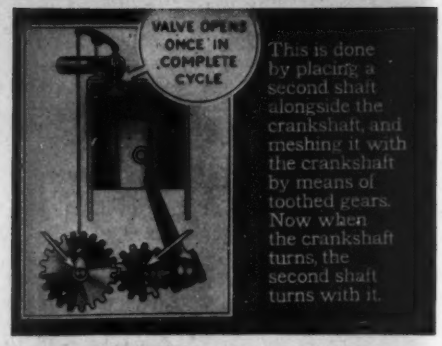
The films have been planned and produced so that they correlate nicely with vocational shop training. They are also of distinct value in teaching mathematics and the sciences on which aviation is based. The instructor upon screening the mechanic's film strips easily determines which subjects best lend themselves to his course.

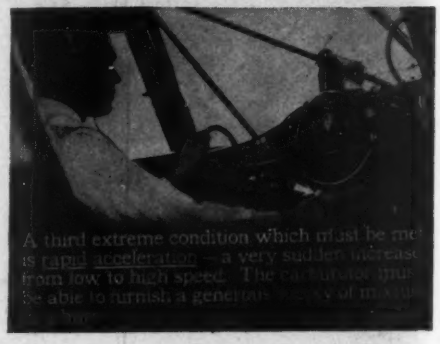
These film strips provide the general principles and procedures in each phase of welding as they are applied in aviation service. Ordinarily, students are shown the films in proper order. The instructor accompanies the projection of the film strip with an explanatory talk, giving most time and attention to the more important points made on the screen. He also permits the students to ask questions. In most instances, students are taken directly to the welding shop where they are allowed to apply the knowledge gained from the lecture and film. A demonstration by the instructor also may be inserted at this point in order to give the student every opportunity to learn how to do a given job in the proper manner.

Let us consider, for instance, the kit set covering oxyacetylene welding:

1. An introduction to welding	Oxyhydrogen, and oxyacetylene welding, pressure gauges, and torches, safety
2. Setting up and lighting the welding torch	Use of equipment, safety precautions
3. Welding flat ripples	Tools, equipment, and materials needed
4. Flat butt welds	Preparation, procedures, inspecting weld, test
5. Fillet welds steel	Tools, equipment, materials, preparation
6. Vertical welds steel	Verticle fusion welding, lap welding, fillet welding, cross welding, inspecting
7. Tube welds steel	Specific operations, materials and preparation
8. Cluster welds	Special tools, preparation, materials, inspection
9. Oxyacetylene cutting	Cleaning, preparing the cut, preparing cutting torch, safety
10. Welding stainless steel	Tools, material, equipment, definition of characteristics
11. Brazing and silver soldering	Definition, tools, equipment, and materials
12. Welding aluminum flat sheets	Characteristics of aluminum, uses of flux, making tack welds, butt weld, lap weld, wandering weld
13. Welding aluminum tubes with sheets	Review of aluminum welding properties, flux, preparation, fillet weld, welding flanges
14. Fuel and oil-tank repairs	Preparation, cleaning metals, safety, tack welding, testing
15. Qualifications test for welders	Test welds, single V butt, tubular butt, vertical fillet, combination sheet and tube, horizontal fillet, checks and tests


3. The Struts or Wires
Look for any signs of stretching or bending. Be sure that all terminal bolts are properly tightened and safetied.


VALVE OPENS ONCE IN COMPLETE CYCLE
This is done by placing a second shaft alongside the crankshaft, and meshing it with the crankshaft by means of toothed gears. Now when the crankshaft turns, the second shaft turns with it.



Samples of the instructional material

Students are allowed the privilege of reprojecting the film strip if they feel a need to reconsider the information conveyed on the picture screen. This tends to save the time of the instructor, who would otherwise have to re-explain the entire material.

Opinion and experience varies as to the amount of time saved by the inclusion of the picture screen in aviation mechanics training work, a saving that is obtained in conveying the elementary information which is a foundation for actual shopwork. It is generally agreed that it is surprisingly great.

SECTIONS FOR THE DRAFTING ROOM

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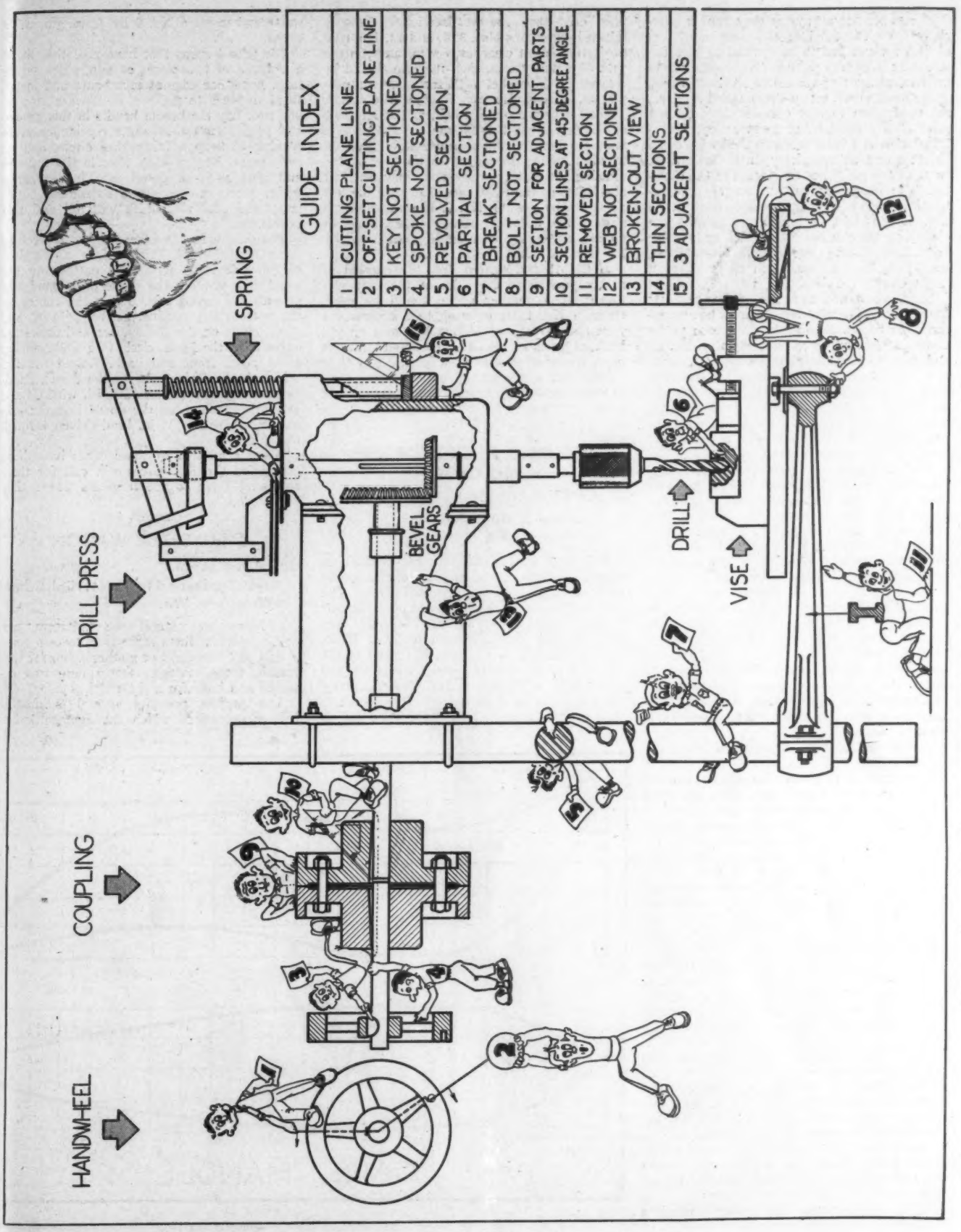
Senior High School
Wauwatosa, Wis.

Larry Grigg, one of the students of the Senior High School, Wauwatosa, Wis., conceived the idea of impressing some gremlins to help in clarifying the unit on section to the drafting students. The accompanying illustration shows how he solved this problem.



The gremlins explain all about sections. Submitted by R. R. Bedker, Senior High School, Wauwatosa, Wis.

Things are not always as they appear especially from the outside; therefore, a system of inside views had to be devised to give the mechanic a clearer picture. These pictures in mechanical drafting are called sectional views.

Sectional views, many times called *sections*, are used when regular outside views do not show clearly the interior construction. A sectional view is a view taken on the inside of an object along an imaginary cut; the part in front of the cut is not considered in the drawing. The imaginary cut surface of the material is shown by light section lines at 45 deg. to the right or left, as is pointed out clearly by gremlin No. 10. Hidden or invisible lines behind the cross-section view should usually be omitted except in cases where it might clarify the drawing.

Symbolic section lines are used to indicate the material. Gremlin No. 9 shows how to indicate cast iron. Frequently draftsmen prefer to use uniformed space lines for all materials and then specify the material. Many companies, regardless of whether they use the symbolic section lines or not, demand the material to be named and specified on the drawing. Some specified materials are given with the heat treatment. There is also a system of symbols for outside views.

The imaginary cut is shown with a cutting plane line, which is a heavy broken line with a long line, two short dashes, and a long line as shown by the gremlins No. 1 and 2. The ends of the lines are usually lettered AA or BB, etc. Arrow heads indicate the direction of sight in which the section is viewed. Some companies use these heavy cutting plane lines, letters, and arrowheads only when extraordinarily complicated sections are to be shown. The cutting plane line is not always a straight line; it may be at an angle, offset or curved. Gremlins Nos. 1 and 2 point out where such cutting plane lines are used. The index letters should be repeated at the point of change in the cutting plane direction. They may be omitted, if the cutting plane line is easy to follow.

A full section view is obtained when the cutting plane line goes across one view. A symmetrical object may be drawn half in section up to the center line, while the other half shows the outside view.

Revolved sections show a cross-section of a piece *revolved* within the view as shown by gremlin No. 5. There are some variations. Sometimes a section line at an angle is revolved to a vertical or horizontal plane and then the section is projected. This will save an extra view.

Some section views are enlarged to make the views exceptionally clear. An example of this is the coupling to which the gremlins Nos. 9 and 10 are pointing.

Broken out or partial sections are sometimes used because a full or half section is not necessary. This section is shown by gremlin No. 6.

Thin sections cannot very easily be cross sectioned; consequently, a solid line is used. Sheet metal, gaskets, and structural steel shapes are shown with heavy line. With two adjacent thin parts a white space is left between them as shown by gremlin No. 14.

The purpose of drawings and sections is to make it very clear what is wanted. To make sections easier to understand, certain conventional ideas are changed as follows:

If a cutting plane line passes through a web, rift, shaft, bolts, arms, rods, rivets, keys, pins, etc., they are *not* sectioned. This is shown by gremlins Nos. 3, 4, and 12. If a true projection is not clear, as, for instance, in the case of a pulley arm, then the arm should be rotated until parallel with the plane of projection. This is also true of holes in a flange.

Section lines are made light and at an angle of 45 deg. from the horizontal. The section lines are parallel and approximately 1/32 in. to ⅛ in. apart depending on the size of the drawing. Adjacent parts are shown with lines at 45 deg. to the right and 45 deg. to the left as shown by gremlin No. 9. If a third part is next to two adjacent parts then a 30-deg. or 60-deg. angle may be used as pointed out by gremlin No. 15.

If the 45-deg. section lines are parallel or nearly parallel to the sides of the part sectioned, then another angle should be used. Gremlin No. 13 is pointing to a broken out view and a removed section is shown on the back of gremlin No. 11. A "break" that is cross sectioned is shown by index No. 7.

Sectional views are of utmost importance in mechanical drafting, and the student should learn how to draw them correctly.

WALKING STICKS FOR THE RED CROSS

O. ARNOLD RADTKE

Peckham Jr. High School
Milwaukee, Wis.

Old mop sticks and brooms, brought to school by the students, may be readily turned into walking sticks for the Red Cross. The mop and broom sticks are sawed off to lengths varying from 28 to 34 in. They are then tapered from ⅞-in. diameter to ⅜ or ½ in. A ½-in. dowel, ¾ in. long, is turned at the top end to fit into the grip. Sandpaper and finish with a French polish. Before cutting off the waste at dead end use this center to drill a 5/32-in. hole, 1 in. deep. Then cut off waste and insert a No. 9 by ¾-in. r.h. wood screw.

For school shops that have no lathes make a V block of two pieces of 1-in. stock 36 in. long. Bevel one edge of each board and fasten them together to make a *V*. Place a stop at one end. Lay the broom handle in this groove and plane. Turn the handle repeatedly while planing to keep a fairly true circle, and an even taper. Bore a ¾-in. hole in the top end and glue a ½-in. dowel into it, leaving a ¾-in. piece of the dowel extending. Sandpaper the cane and finish with oil and wax or varnish.

The grip or handle is made from a piece of scrap lumber 1 in. thick. Make a template of the side view, scribe the pattern on the wood, and saw out the shape on a band saw or with the coping saw. Locate the center on the bottom flat surface. Scribe a ¼-in. and ⅞-in. circle on this flat surface and chisel the edges from the ⅞-in. circle to a well-rounded blunt point front and back. Round the top and bore the ¼-in. hole for the dowel. Sandpaper the grip smooth and finish with oil and wax or varnish. Glue the dowel into the grip and secure with a ½-in. brad driven through the side.

When a number of these canes have been completed the Red Cross will call for them and send them to the hospitals where they are needed.

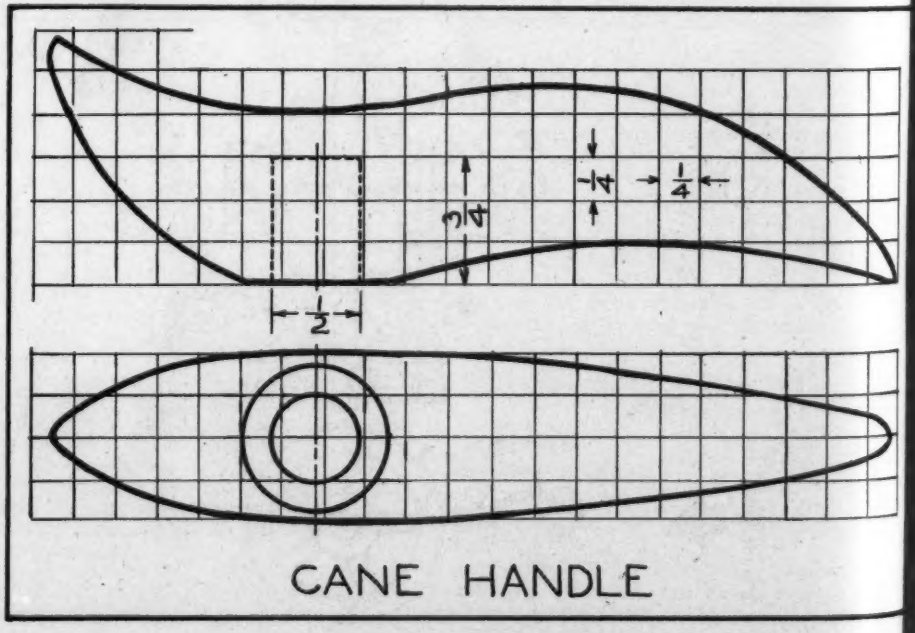
CHILD'S TEA WAGON

GEORGE ELLESON

Boys' Trade and Technical High School
Milwaukee, Wis.

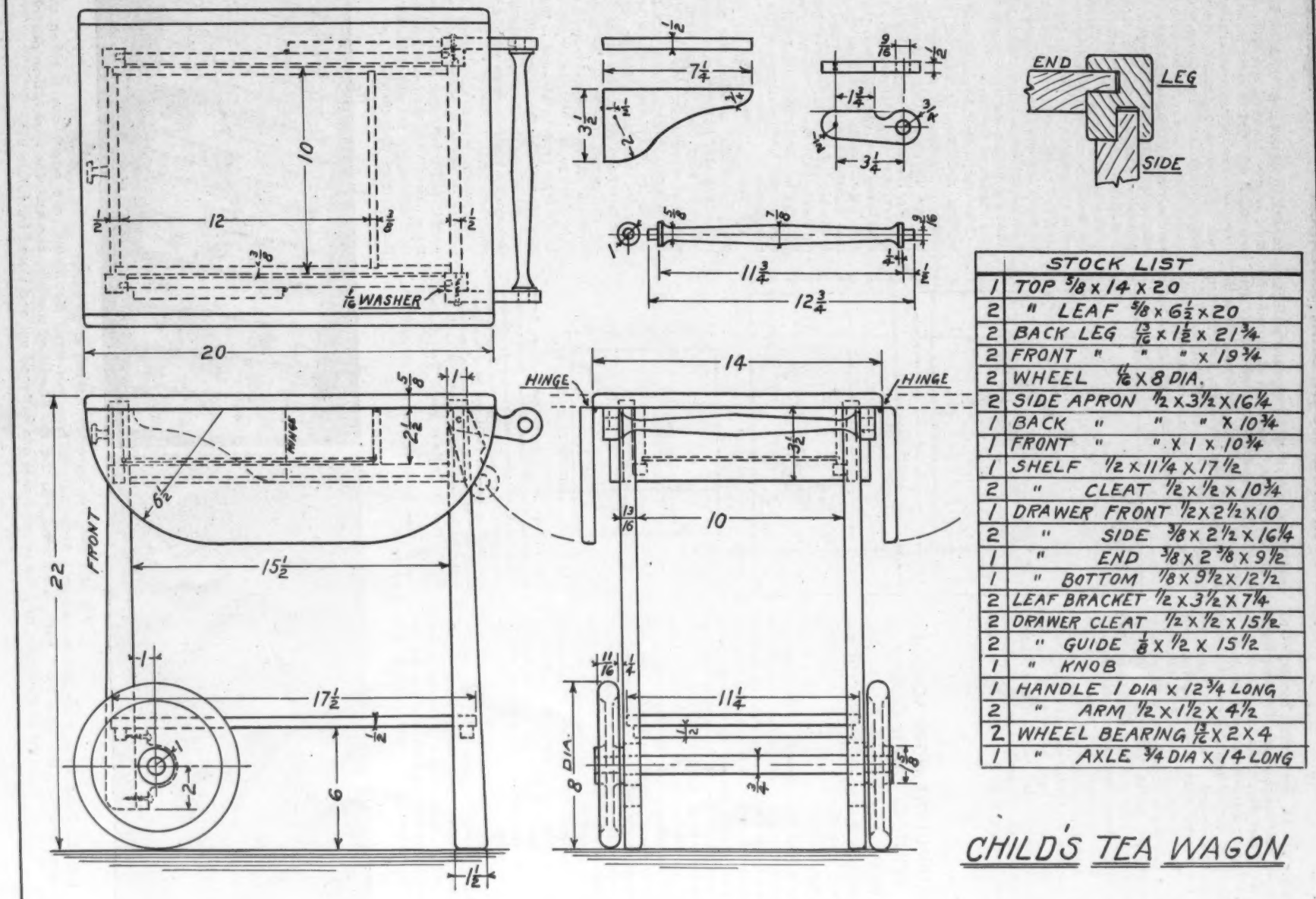
Children are natural-born imitators, and nothing pleases them more than to own some article just like dad's or mother's. So, for that reason, the tea wagon shown here was designed and built for a little girl of five years.

The project presents several interesting tooling operations which the average indus-



CANE HANDLE

Submitted by O. Arnold Radtke



	STOCK LIST
1	TOP 5/8 x 14 x 20
2	" LEAF 5/8 x 6½ x 20
2	BACK LEG 13/16 x 1½ x 21¾
2	FRONT " " " x 19¾
2	WHEEL 11/16 x 8 DIA.
2	SIDE APRON ½ x 3½ x 16¼
1	BACK " " " x 10¾
1	FRONT " " x 1 x 10¾
1	SHELF ½ x 11¼ x 17½
2	" CLEAT ½ x ½ x 10¾
1	DRAWER FRONT ½ x 2½ x 10
2	" SIDE ⅜ x 2½ x 16¼
1	" END ⅜ x 2⅜ x 9½
1	" BOTTOM ⅛ x 9½ x 12½
2	LEAF BRACKET ½ x 3½ x 7¼
2	DRAWER CLEAT ½ x ½ x 15½
2	" GUIDE ⅛ x ½ x 15½
1	" KNOB
1	HANDLE 1 DIA x 12¾ LONG
2	" ARM ½ x 1½ x 4½
2	WHEEL BEARING 13/16 x 2 x 4
1	" AXLE ¾ DIA x 14 LONG

CHILD'S TEA WAGON

Child's tea wagon designed by George Elleson, Boys' Trade and Technical School, Milwaukee, Wis.

trial-arts student can easily handle. Hard maple was used throughout and it was finished with a Colonial stain and wax.

The drawing does not attempt to show all details of the various joints. The student who can handle a project of this kind should decide for himself what kind of joint is best suited. The drawer is built with extension sides so that it can be pulled out 12 in. without dropping it to the floor.

The drawer knob can be made to suit one's fancy. Solid wheels were used on this tea cart, but if built-up wheels with spokes are preferred, they may be used as well.

If one has the cutter to make a drop-leaf joint, that would look better than the one used; however, that would mean special hinges, and they are hard to get now.

The sizes given in the stock list are finished sizes.

DISTRIBUTION IN THE SCHOOL PRINTING LABORATORY

CHARLES R. KINISON

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The task of getting pupils to distribute the type after the job has been run is one of the major problems which confronts the printing instructor. Distribution is a *dishwashing* job and many people are averse to continuing to work at such jobs after the constructive and productive part of the task is finished.

One of the objectives of industrial-arts courses as enunciated in the Bulletin of the American Vocational Association, *Standards of Attainment in Industrial Arts Teaching*, is: "To develop in each pupil the habit of self-discipline which requires one to do a thing when it should be done, whether it is a pleasant task or not." Certainly it is desirable to develop such an attitude on the part of the printing students and if this can be accomplished the problem of the printing teacher will be simplified.

A habit cannot be developed overnight, and this habit of self-discipline is no exception to the rule. It takes many and frequent repetitions of an accomplishment to develop it into a habit. If the printing instructor can get the pupils to realize that the job is not finished until he has put all of the type and materials back where they belong, and if he will see that the pupils put these materials away after each and every job has been run, the habit will be well on the way toward being established.

Progressive teachers are constantly on the alert for ways and means of getting the pupils to stick to the job until the habit has become more or less developed and fixed. Any methods which will tend to assist in this development and any devices which will make the task easier for both teachers and pupils are welcomed by them. The device which is described here is one which has been used very successfully with beginning classes during the past few years, and it is hoped that other printing instructors will find it helpful in getting the type back in the proper cases.

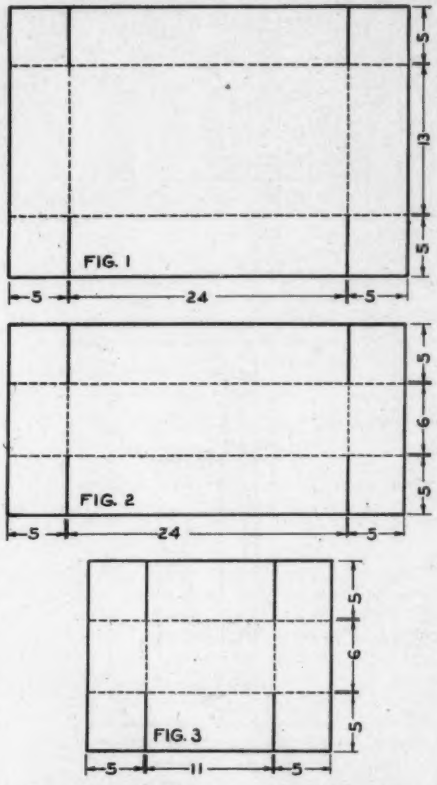


Fig. 1. Plan for form to make large boxes. Dimensions are in picas. Dotted lines represent two-point brass rules, and solid lines represent two-point cutting rules. Use two 34-pica rules for the long creases. These will be a few points short, but the creases will be strong enough to make folding easy. Size of stock: 3⅜ by 5¾ in.
Fig. 2. Plan for half-size boxes. Size of stock: 2¾ by 5¾ in.
Fig. 3. Plan for small box. Size of stock: 2¾ by 3½ in.

This device consists of using collapsible cardboard boxes in the California job case while the pupil is distributing the type. Figures 1, 2, 3, 4, and 5 show how these boxes are made and how they are placed in the case. Each paper box is a unit which will lie flat when not in use, and this feature makes for easy storage of the boxes.

After the student has completed his composition and run the requisite number of copies on the press he is ready to distribute the type. Before starting to distribute, he will fold and place these paper boxes in the compartments of the California job case. After distributing the type into these paper boxes, each paper box is lifted from the case, the type is dumped into the hand and each piece is checked before it is put in the proper compartment of the case. In this way the distribution can be checked and the pupil is assured that he will have a clean case for his next composition.

The boxes may be made on any platen press by locking up brass rule and cutting rule as indicated in the diagram, removing the rollers to keep from cutting them with the rule, and running the job as if it were a printed form. Gripper fingers may be needed to keep the papers from sticking to the cutting rules, and care should be exercised to feed each paper to the pins so that the creasing and cutting will be in the proper place. Plenty of soft paper should be used under the draw sheet so that definite creases are made by the brass creasing rules and so that definite cuts are made by the cutting rules. The ears that are left on the corners of the boxes help to keep the boxes in shape while distributing and checking.

Any waste bristol stock, even if it has printing on one or both sides, or is of several weights and colors, may be used for making these boxes. After the boxes have been used they may be laid flat and stored for use with the next class of beginners.

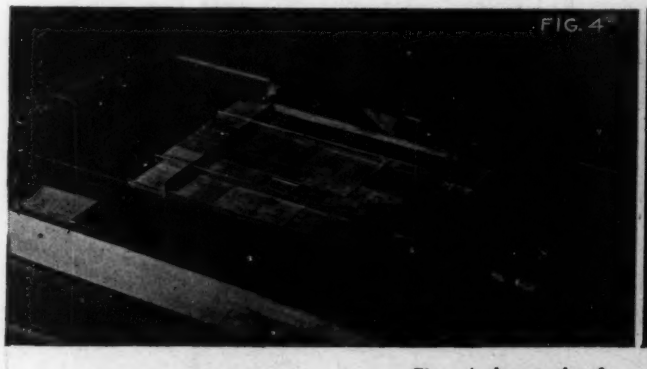


Fig. 4 shows the form for making large boxes

Fig. 5. Type case with boxes inserted. After all the type has been distributed, one paper box is taken out after another, the type from each is emptied into the left hand and carefully checked. The type is then put into the proper case, and the paper boxes are flattened out and stored for future use

THAT NEW MATERIAL — PLUSWOOD

The research department of Pluswood, Inc., Oshkosh, Wis., has produced a new variety of plywood which has wonderful qualities.

It is a resin impregnated plywood heated to a high temperature by a special electric heating unit, and simultaneously compressed under exceedingly heavy pressure. Experimental work at the U. S. Forest Products Laboratory under the direction of Dr. Alfred J. Stamm and R. M. Seborg showed that this new treatment gave wood startling qualities.

The new product weighs less than aluminum, yet is as strong as iron. It possesses a rich dark brown color, with a high permanent gloss finish showing wood grain. It is highly resistant to combustion and to mild acids, and is unaffected by moisture and by extremes of temperature.

It can be sawn, drilled, turned, threaded, milled, and tapped. While the present output of this new material is entirely absorbed by war-production work, largely in airplane manufacturing, it holds great promise for the future, because preliminary tests show that it can replace metals in many instances.

It has already been tried out as material for gears and bearings for which purposes it seems especially suited. Because of its beautiful, almost scratchproof, surface it may be used for store fronts, stair rails, interior trim, store counters, bars, and bowling alleys. It can also be utilized for golf-club heads and shafts, tennis racquets, boat and ship decking, and structural beams.

This firm, through its research, has developed a formula whereby the use of a highly critical chemical material used in the impregnation of plywood can be greatly reduced. This new process has resulted in producing a saving in the resin content of the wood while increasing its weight-strength ratio.

Pluswood, Inc., has patriotically given this newly discovered method of impregnating wood to the United States, so that other war plants may adopt it and profit from it.

WHITTLING-JACKKNIFE TECHNIQUE

W. BEN. HUNT
Hales Corners, Wis.

(Continued from page 255 of the June, 1943, issue)

Seal

The seal shown herewith is a real streamlined job. That means that this piece of whittling calls for some fine sandpapering. However, there are a few things that must be done before sandpapering. First of all, as usual, lay out the silhouette on a 3 by 4¾ by 5¼-in. block of wood. The seal shown was whittled out of mahogany, but any softwood will do. The grain runs up and down.

After the silhouette has been cut, lay out

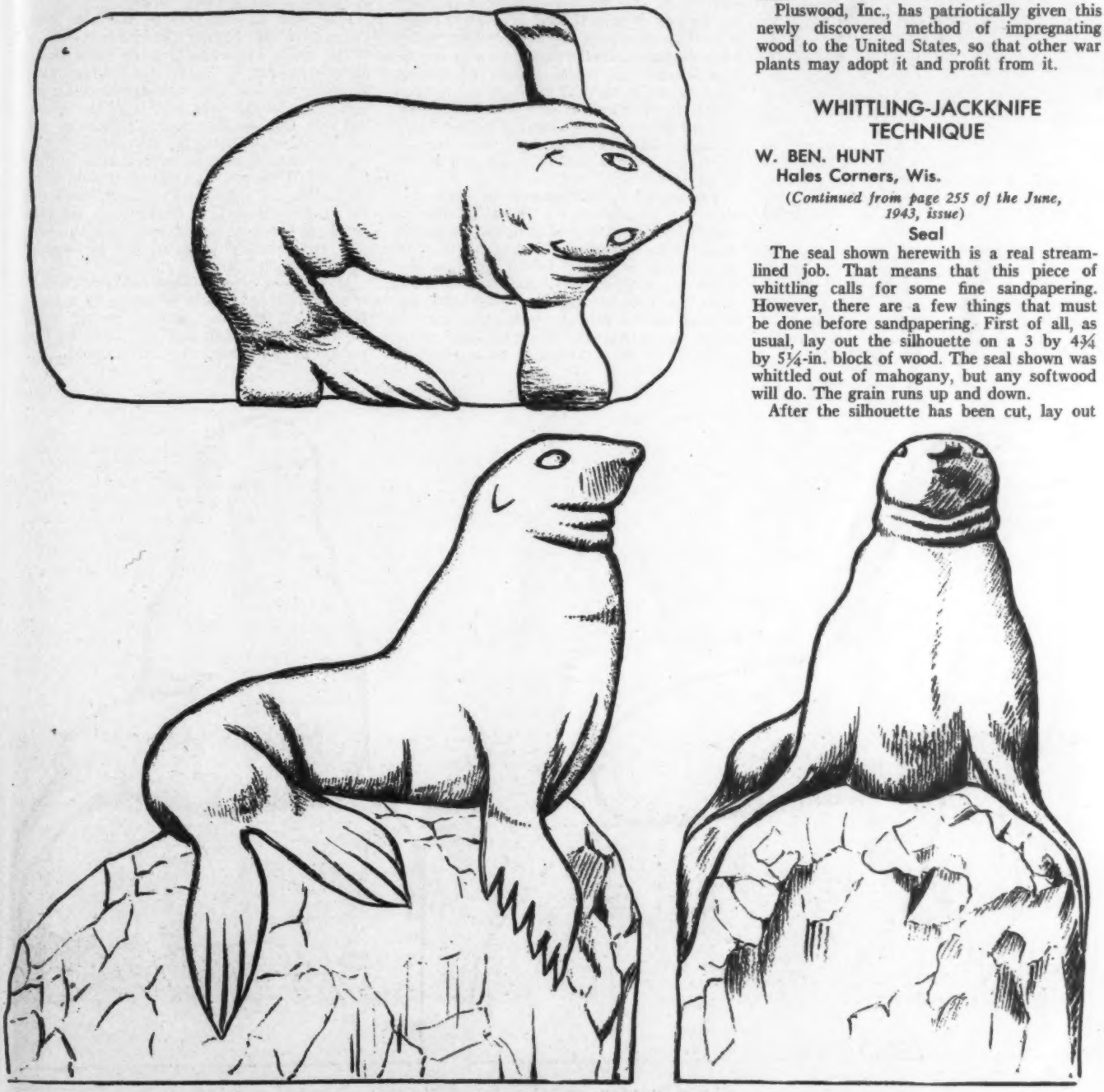


Fig. 129. Top and front views of seal

the top view, as the seal is not centered on the block. If you have a crooked knife you will find it will save a lot of time for roughing out the seal. The whittling itself is not too difficult as every part is more or less rounded nicely.

After finishing the whittling, smooth the seal with fine sandpaper being careful not to sand the base. The seal may then be given a coat of brown walnut stain. After carefully wiping it, let it dry after which two coats of floor wax should be applied. As a last touch, polish the seal with a piece of flannel.

SAW RIG

HOWARD W. BOEKELOO
Central High School
Kalamazoo, Mich.

The saw rig shown in the accompanying illustration will successfully cut logs up to 13 in. in diameter, using a 3-ft. one man saw. In fact its capacity is limited only by the length of the saw. For long, heavy logs it may be used as a drag saw by removing the sawbuck attachment and moving it along the log for each cut. The speed of the large pulley approximates 60 r.p.m. using the size of pulleys indicated and driven with a motor running at 1760 r.p.m. This speed seemed to be the most satisfactory of several used. If a larger pulley is used on the motor the first plywood pulley must be proportionally larger to give the required speed. The writer used an old washing machine motor rated at 1/6 h.p., but believes that it developed closer to ¼ h.p. The weight of the motor lies on the first drive belt but a block placed under the motor base may be used to take part of this weight and relieve strain on the belt.

The outfit was designed to be built at a minimum of expense out of easily obtained materials. The plywood pulleys, preferably made of waterproof stock, were cut to a circular shape on a band saw. They were then trued up, grooved for a half-inch belt and holes bored for bearings on a wood lathe. The bearing on the first plywood pulley may be of better construction, but those made of the parts shown have proved to be satisfactory. Three-eighths inch pipe (actually about 7/16-in. inside diameter) should be drilled out to ½ in. for the bolt used as a shaft on this bearing.

The flanged bearing on the second pulley may be made by turning a short piece of ½-in. pipe tightly into a ½-in. pipe flange. As this pipe is actually 9/16 in. in diameter, it may be drilled to ⅝ in. Drill on a lathe after centering carefully in the chuck.

It was found that a smaller weight placed at each end of the saw seemed to give a smoother action than only one large weight. When logs or pieces are not of sufficient weight to hold themselves tightly in the sawbuck, they may be secured by using the straps described in the assembly drawing.

The wire to the motor may be first brought to the top of the guide where a switch can be located so that the whole starting process can be carried out by one man. To start the saw grasp the handle with the right hand, remove the bolt from the guide, and then turn on the current. Then after the saw is in motion, drop the saw slowly to the log and allow it to make several cuts until it is *seated*. Then you may take your hand from the handle and stand back at leisure until the cut is completed. If a tendency to slippage develops between the second belt and the 3-in. metal pulley, an idler may be devised to keep this belt tight.

If this saw is used where electric current is not available it might be driven by a small Briggs and Stratton gasoline motor, being careful to figure out the right sizes for the pulleys so as to obtain the correct speed.

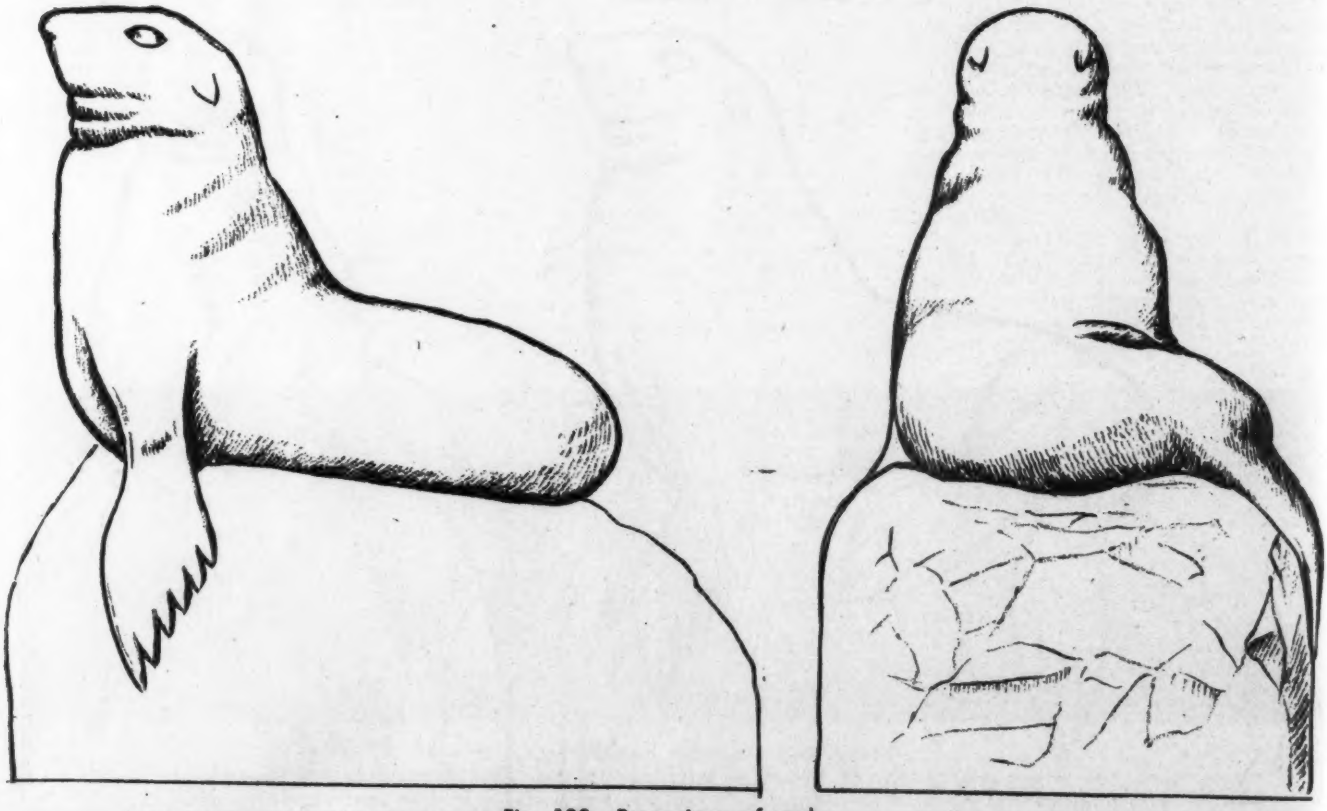
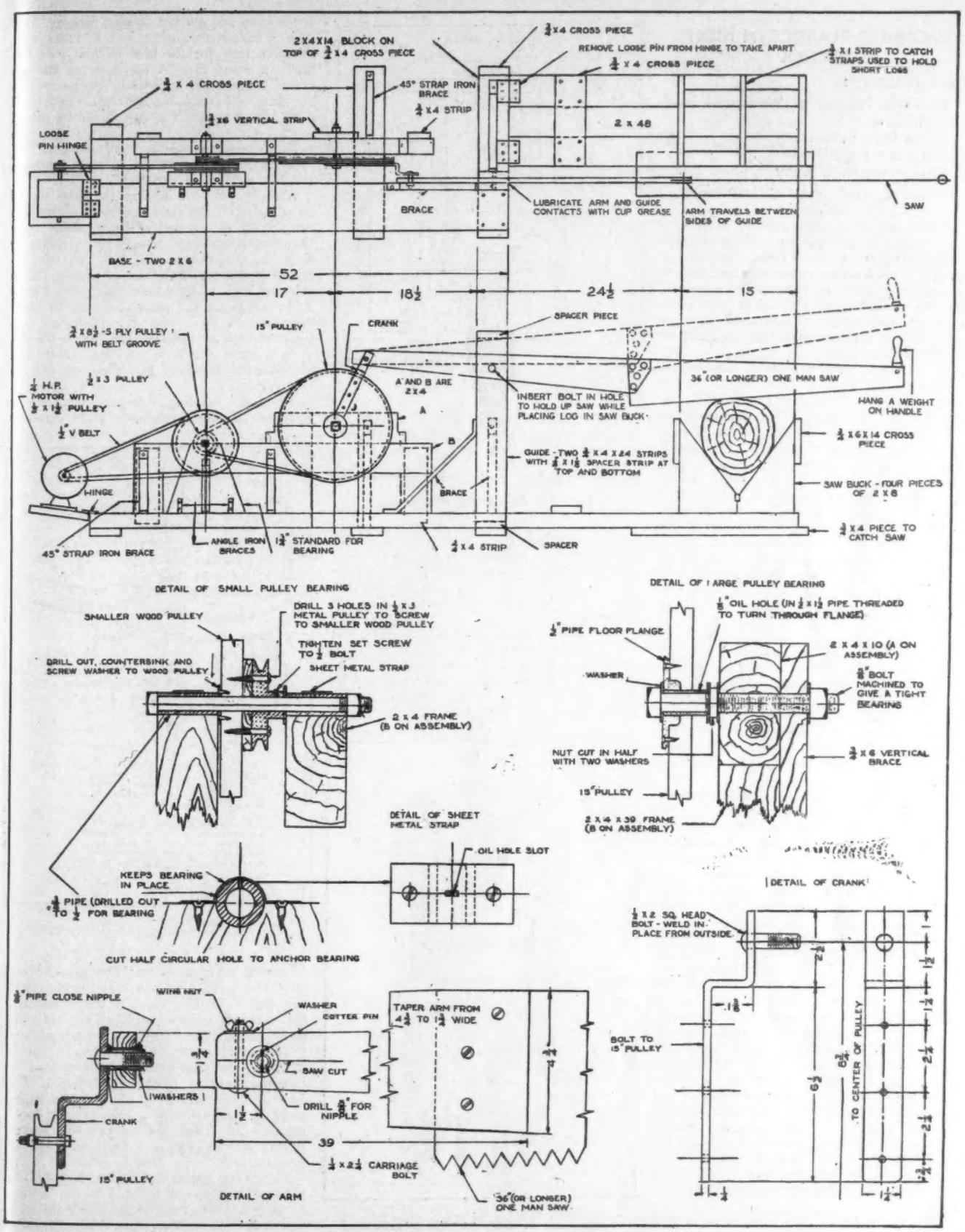


Fig. 130. Rear views of seal


2X4X14 BLOCK ON TOP OF ¾ X 4 CROSS PIECE
¾ X 4 CROSS PIECE
REMOVE LOOSE PIN FROM HINGE TO TAKE APART
¾ X 1 STRIP TO CATCH STRAPS USED TO HOLD SHORT LOGS
¾ X 4 CROSS PIECE
45° STRAP IRON BRACE
¾ X 6 VERTICAL STRIP
¾ X 4 STRIP
LOOSE PIN HINGE
2 X 48
BRACE
LUBRICATE ARM AND GUIDE CONTACTS WITH CUP GREASE
ARM TRAVELS BETWEEN SIDES OF GUIDE
SAW
BASE - TWO 2 X 6
52
17
18½
24½
15
¾ X 8½ -5 PLY PULLEY WITH BELT GROOVE
15" PULLEY
CRANK
SPACER PIECE
¼ H.P. MOTOR WITH ¾ X 1½ PULLEY
½ X 3 PULLEY
A AND B ARE 2X4
36" (OR LONGER) ONE MAN SAW
INSERT BOLT IN HOLE TO HOLD UP SAW WHILE PLACING LOG IN SAW BUCK
HANG A WEIGHT ON HANDLE
½" V BELT
¾ X 6 X 14 CROSS PIECE
GUIDE - TWO ¾ X 4 X 24 STRIPS WITH ¾ X 1½ SPACER STRIP AT TOP AND BOTTOM
HINGE
BRACE
SAW BUCK - FOUR PIECES OF 2 X 6
¾ X 4 PIECE TO CATCH SAW
45° STRAP IRON BRACE
ANGLE IRON BRACES
1½" STANDARD FOR BEARING
¾ X 4 STRIP
SPACER
DETAIL OF SMALL PULLEY BEARING
SMALLER WOOD PULLEY
DRILL 3 HOLES IN ¼ X 3 METAL PULLEY TO SCREW TO SMALLER WOOD PULLEY
TIGHTEN SET SCREW TO ¼ BOLT
DRILL OUT, COUNTERSINK AND SCREW WASHER TO WOOD PULLEY
SHEET METAL STRAP
2 X 4 FRAME (B ON ASSEMBLY)
DETAIL OF LARGE PULLEY BEARING
½" PIPE FLOOR FLANGE
⅝" OIL HOLE (IN ¾ X 1½ PIPE THREADED TO TURN THROUGH FLANGE)
2 X 4 X 10 (A ON ASSEMBLY)
WASHER
⅝" BOLT MACHINED TO GIVE A TIGHT BEARING
NUT CUT IN HALF WITH TWO WASHERS
¾ X 6 VERTICAL BRACE
15" PULLEY
2 X 4 X 39 FRAME (B ON ASSEMBLY)
DETAIL OF SHEET METAL STRAP
OIL HOLE SLOT
KEEPS BEARING IN PLACE
½ PIPE (DRILLED OUT TO ½ FOR BEARING
CUT HALF CIRCULAR HOLE TO ANCHOR BEARING
DETAIL OF CRANK
¾ X 2 SQ. HEAD BOLT - WELD IN PLACE FROM OUTSIDE
⅜" PIPE CLOSE NIPPLE
WING NUT
WASHER
COTTER PIN
TAPER ARM FROM 4½ TO 1¾ WIDE
SAW CUT
WASHERS
DRILL ⅜" FOR NIPPLE
CRANK
39
¼ X 2½ CARRIAGE BOLT
15" PULLEY
DETAIL OF ARM
36" (OR LONGER) ONE MAN SAW
BOLT TO 15" PULLEY
TO CENTER OF PULLEY

Assembly and detail drawing of saw rig

MOLDING PLASTICS IN HIGH SCHOOL

DALE PETERSON
Formerly Teacher of Woodwork and Hobbies
Irving High School
Salt Lake City, Utah
Now in the U. S. Army

(Continued from page 433 of the December, 1942, issue)

Before one can do any molding of plastics some means of heating the molding powders and molding dies must be found. This source of heat must be kept under accurate control as the temperatures at which plastics respond best to available pressures does not allow extremely wide ranges of variability. In most cases, however, the temperature could not be described as critical.

If the plastic molding powder is made too hot, several things may occur. If the heat is sufficiently high, chemical decomposition of plastic may take place. This decomposition may not be apparent at the time, but it may, nevertheless, cause gases to form in the molding, thus causing bubbles and cavities. This obviously will produce an imperfect article. Too much heat may also cause the powder's viscosity to become so reduced that it flows readily into minute cracks and spaces of the dies, causing an excessive amount of "flash" to occur. This flash is a fin that must be removed later, which takes time and effort. This flash also fills the crevices and clearance areas of the dies, making it hard to separate them when the molded article is to be removed. Too much heat also may cause the plastic powder to become excessively sticky and adhere to the mold. This is particularly true if the proper plasticizers and lubricants have not been incorporated into the molding powder. Another reason why the dies should be kept as cool as possible is so that they may be handled more conveniently. Otherwise excessive mold-cooling time may be demanded.

Insufficient heat may also cause considerable trouble. The most common result of too little heat is in the lack of fusion between the individual grains of powder. In addition, the powders will not be sufficiently soft to force themselves into all the cavities of the mold. Insufficient heat can also cause gas bubbles to appear. This comes about when the heat is sufficient to force the volatile impurities from the powders, but not high enough to make the powder soft enough to allow the escape of the gas. Thus the gas becomes entrapped in the mold. Air can also be entrapped in the mold in this manner. In general, the lower the temperature of the molding powder, the greater the pressure required for successful molding. The pressure required may become so great as to be beyond that which can be furnished by the available equipment. If proper heating conditions and temperatures are maintained, however, nominal pressures may be used with excellent results.

Commercial molding dies are heated by steam jackets, or by pockets which contain electric heating elements. The temperatures in either case are closely watched and controlled.

Any thermostatically controlled oven is a suitable source of heat. A secondhand electric baking oven is admirable if the thermostatically controlled switch is accurate. Electricity is to be favored over gas due to the fact that some of the plastics will burn if they are ignited.

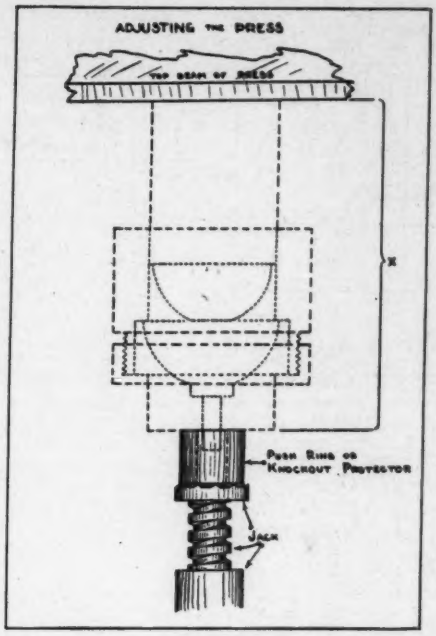


Fig. 1. Adjusting the press

The accompanying illustrations show the different steps through which the operator must carry his work in plastic molding. The first step is to start the oven heating and be sure it is set so as to maintain the proper temperature. The dies may then be placed in the oven and allowed to start heating. This step is called preheating, and it takes considerable time for the heat to *soak* into the heavy molding dies. A half-hour at the required temperature is generally necessary, but the time will vary for different molds and room temperatures. The dies should be placed in the center of the oven so that they are midway between the top and bottom. The temperature at the center is more uniform and less subject to variation.

While the dies are heating, the press should be adjusted to the right size so that the dies can readily be inserted without taking much time for adjustments. It may be necessary to have the dies out of the oven for this adjustment, but not if the size of the die (when extended) is measured beforehand. See Figure 1. In adjusting the press, be sure to leave room for the push ring. This push ring is a piece of pipe or coupling that gives the die a base upon which to sit, but which will not push the knockout punch up into the die cavity.

When the molding dies have reached the molding temperature, dump in a carefully measured amount of molding powder and allow this powder to heat while in the mold. See Figure 2. The mold is left open until the powder becomes soft. This softening period usually takes about five or ten minutes.

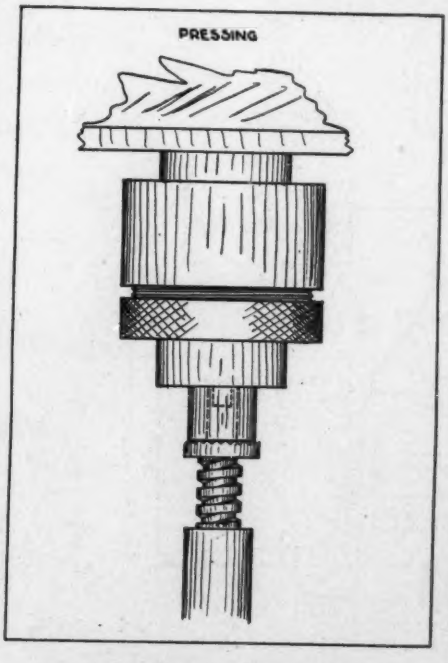


Fig. 3. Putting on the pressure

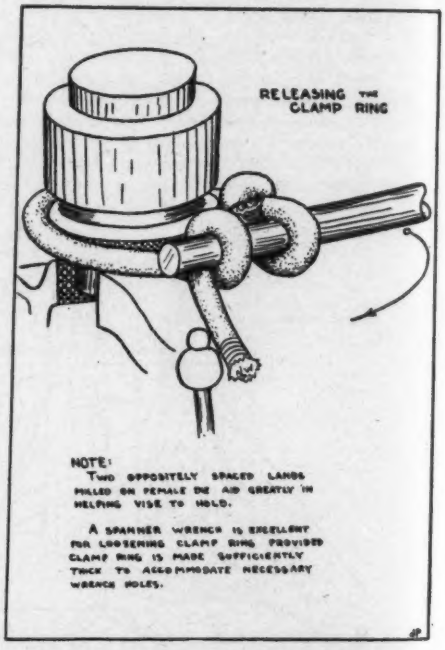

RELEASING THE CLAMP RING
NOTE:
TWO OPPOSITELY SPACED LANDS MILLED ON FEMALE DIE AID GREATLY IN HELPING VISE TO HOLD.
A SPANNER WRENCH IS EXCELLENT FOR LOOSENING CLAMP RING PROVIDED CLAMP RING IS MADE SUFFICIENTLY THICK TO ACCOMMODATE NECESSARY WRENCH HOLES.

Fig. 4. Releasing the clamp ring

The exact amount of powder to use in charging the mold may be determined by experiment or it may be calculated. This may be done by use of some of the figures given in connection with each type of molding powder. These figures are the specific gravity, density, specific volume, and the compression ratio.

To use the specific gravity method, first fill the mold cavity with water. This can be done by sealing up the cracks from which the water will leak with a soft wax. When the mold

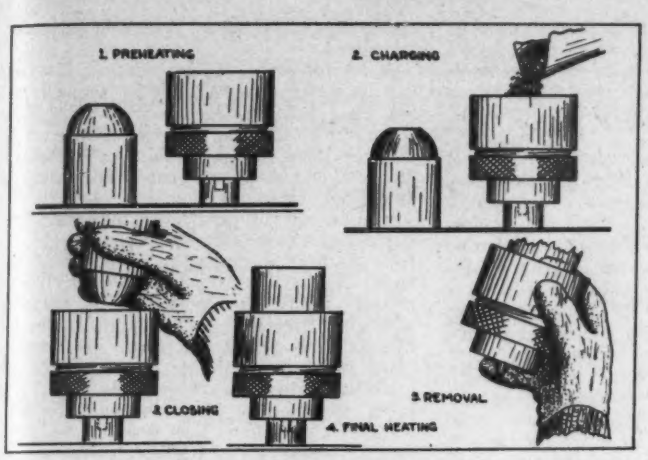


Fig. 2. Preheating, charging, closing, final heating, and removal

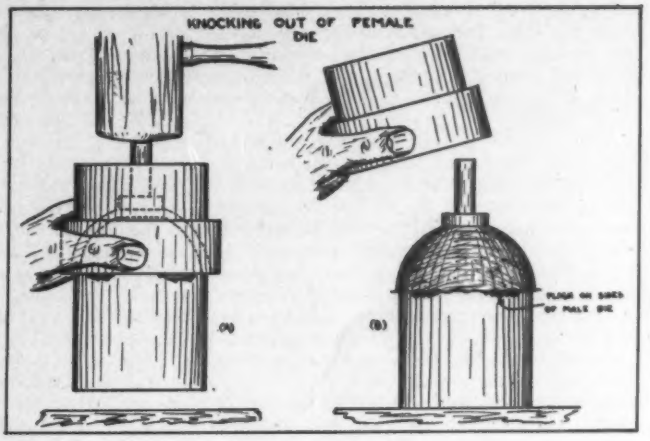


Fig. 6. Removing female die

cavity is filled, carefully empty all the water (without losing any) into a suitable container and weigh it. The net weight of the water (without the weight of the container), when multiplied by the specific gravity, will give the exact amount or weight of powder to use.

If the water from the above experiment is measured to determine the volume of the mold in cubic inches or centimeters, then the density, specific volume, or compression ratio can be used to calculate the required amount of powder. The density is the weight of one cubic centimeter (in grams) of volume. The specific volume is the number of cubic inches per pound of plastic. The compression ratio is the volume of powder that it takes to make a cubic inch of the solid plastic. Naturally, the compression ratio will vary according to the fineness of the molding powder. It, therefore, must be used according to the powder manufacturer's specifications and only for his product and not those from any other firm. In general, it is best to measure molding powder by weight rather than by volume if accurate results are to be expected.

When the powder in the molding dies has softened from the heat of the dies and oven, it is time to place the male die in the guide sleeve and let it settle slowly into the mold. This is called "closing the mold." Heavy gloves must be used to handle the hot dies to prevent burns. Two pair work fine — a heavy pair of mittens over another pair of gloves. If the outer gloves are made of some heat-resisting fabric, better protection from the heat is secured. Leather also works well. To prevent being burned, do not hold the die in the hand longer than necessary. At the same time, do not hurry, but be sure to start the male die in straight.

The mold may now be removed from the oven and clamped up in the press. See Figure 3. This operation can best be done by two operators, one of which is to hold the dies, locate them properly and straight in the press, and act as director of the two operators. The second operator works the jack and makes any adjustments the other tells him to do. During all these operations, care must be taken not to tip the mold so that the male die will slide out. Care must also be taken to prevent jarring the knockout punch up into the mold cavity. All these operations should be practiced by students when the dies are cold, before they attempt to use hot dies.

It is usually best to leave the mold clamped in position until it cools, but not always

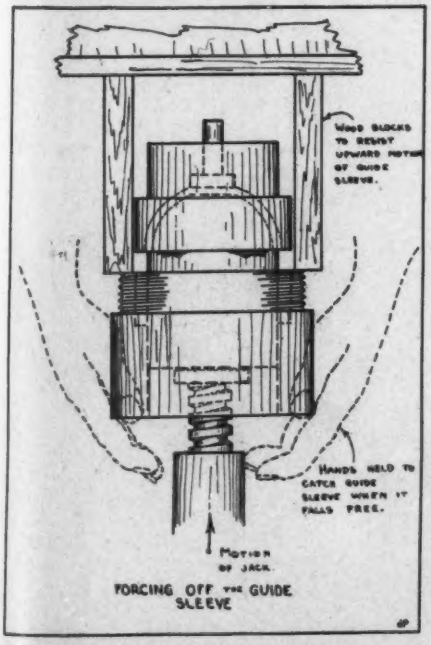

Wood blocked to resist upward motion of guide sleeve.
Hands held to catch guide sleeve when it falls free.
Motion of jack.
FORCING OFF THE GUIDE SLEEVE

Fig. 5. Forcing off the guide sleeve

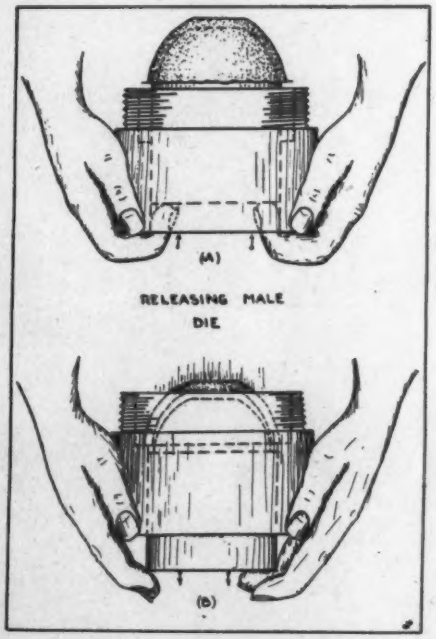


Fig. 7. Removing male die

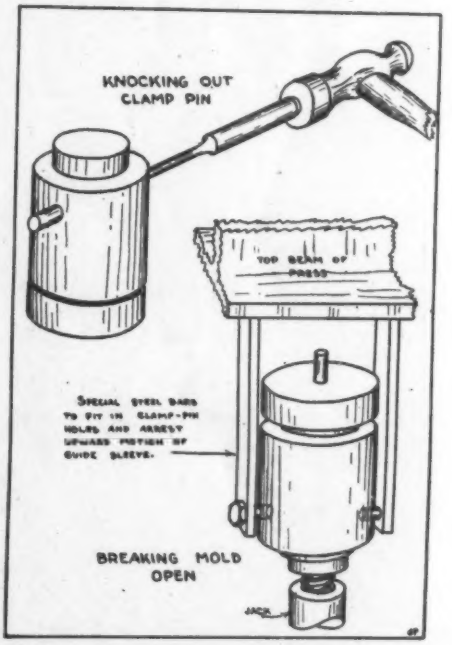

KNOCKING OUT CLAMP PIN
Top beam of press
Special steel bars to fit in clamp-pin holes and arrest upward motion of guide sleeve.
BREAKING MOLD OPEN
Jack

Fig. 8. Separating parts of pin-type mold

necessary if the operator does not mind handling hot dies. The mold should stay under full pressure for a sufficient time, however, to allow the powder to properly flow and adjust itself within the mold to make perfect fusion at all points.

When the dies are removed from the press, the clamp ring is first loosened and removed. Due to the expansion of the hot dies and the pressure exerted by the plastic material inside, it will generally be found that the clamp ring is stuck too tight for removal by hand. The dies are placed in a vise, as shown in Figure 4, and the ring is removed as shown. A spanner wrench works better than the rope and stick method, but it requires an additional piece of equipment to be made. The ropes and stick can be readily found.

Now that the clamp ring is off, it will be found that the sleeve and dies are still tightly stuck together. This is due to the plastic that has flowed between them, causing them to *freeze*. It is but a simple matter to force the guide sleeve off the dies by using the press as shown in Figure 5.

Now a sharp blow on the knockout punch will jar the female die free from the plastic molding. See Figure 6. In doing this, hold the pieces a short distance above the workbench so that when the male die and the molding fall free they will not drop far enough to do damage to the bench or to themselves.

After removing all the flash from the sides of the male die and from the inside of the guide sleeve (the flash will usually wipe off with a rag or soft stick of wood; do not use a metal wiper), place the male die again inside the guide sleeve as shown. The male die can now be removed from the plastic molding by pushing the die upward (see A in Figure 7), inside the sleeve and then letting it fall, as at B. While the die is falling, jerk the sleeve sharply upward to accentuate the motion. When the plastic molding strikes the shoulder of the guide sleeve, it will lodge there, letting the die fall free. As the die falls out of the guide sleeve it is caught in the fingers to prevent damaging it. The plastic molding, which is now sticking inside the guide sleeve, can be removed with the fingers.

Figure 8 shows how the pin type of mold is broken open. When the pin has been removed, the method is used to push the dies out of the guide sleeve. Other steps are the same as those described for the ring-clamped types.

(To be continued)

A TRI-ARTS EXHIBIT

P. G. FRASIER

Director, Industrial Education
Burlington, Iowa

The illustration accompanying this article is not presented primarily to show another exhibit of industrial-arts projects, but rather to show the value of combining with other arts groups in the school system in exhibiting schoolwork.

A careful study of the picture will show that each type of work not only complements the other, but that each requires a type of space which cannot be used by the other. And that the three, public school arts, household arts, and industrial arts, combined, makes a much more artistic display than could be accomplished by any department by itself.

High up on the walls, approximately 15 ft. from the floor, is an ideal place to display the large art panels of the lower grades. These pictures are the free expression of children, with little attention given to detail. Lower on the wall are placed the panels of intimate detail and delicate coloring. Craft projects are exhibited on the long tables at the side of the room, and clothing at a low point for immediate observation, thus leaving the floor free for the display of furniture pieces.

Another distinct advantage of combining the arts in an exhibition is that the work presented is of all the pupils of all schools, and consequently commands the attention of a larger group of parents in the community.

To increase the attendance at the exhibition, invitations were sent to all service clubs and several ladies' organizations in the city, and special hours set aside for private showings to such groups.

More than 4500 people visited the exhibit. The visitors were from seven different states; from 14 cities in a neighboring state, and from 23 cities in the home state.

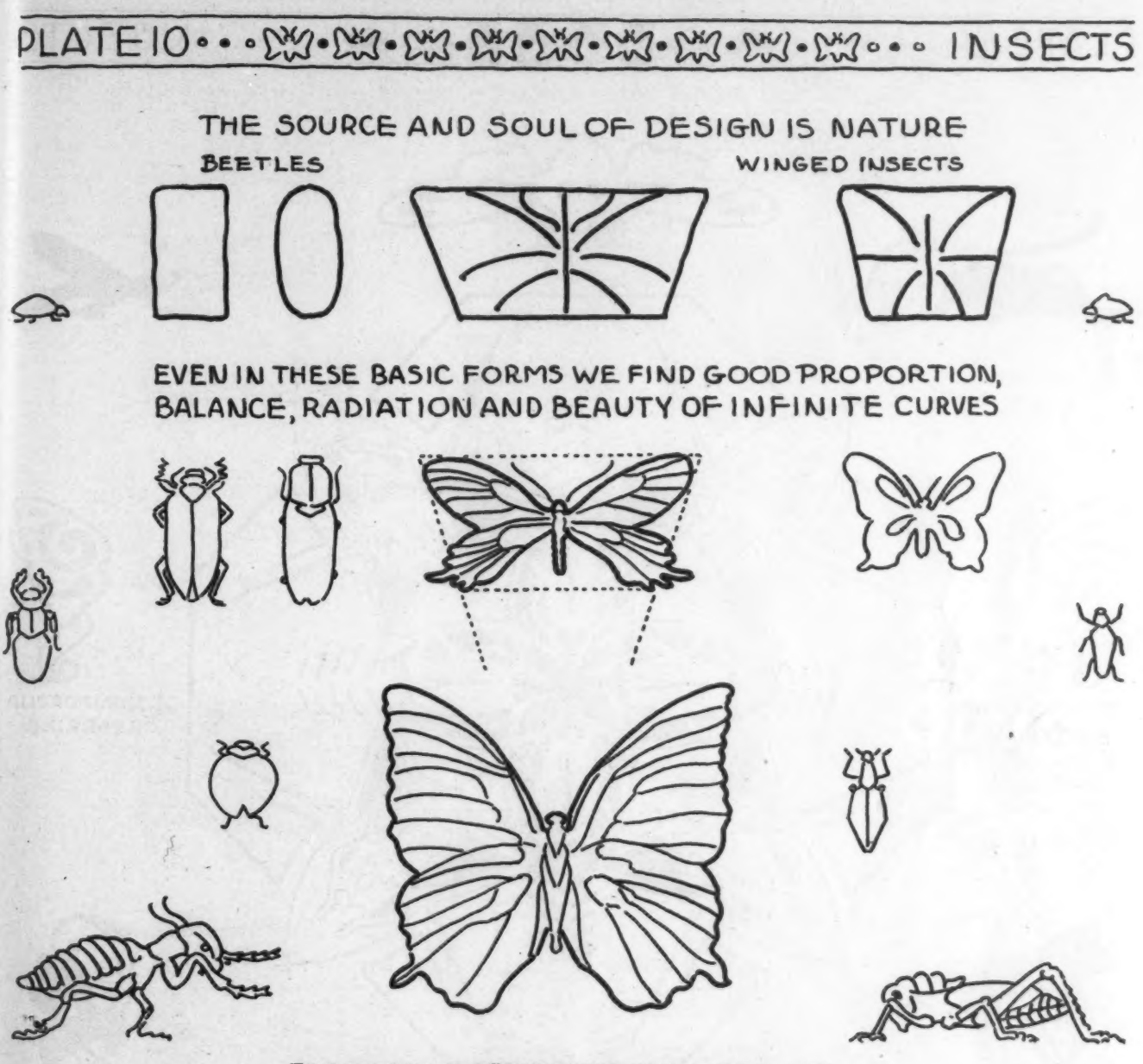


PLATE 10 INSECTS
THE SOURCE AND SOUL OF DESIGN IS NATURE
BEETLES
WINGED INSECTS
EVEN IN THESE BASIC FORMS WE FIND GOOD PROPORTION, BALANCE, RADIATION AND BEAUTY OF INFINITE CURVES
THE MORE WE DESIGN AND THE MORE WE OBSERVE NATURE THE MORE CONSCIOUS WE BECOME OF THE LAW OF THE DESIGNER OF THE UNIVERSE WHOSE RULES OF HARMONY GOVERN THE POET, THE MUSICIAN AND THE ARTIST IN THEIR COMPOSITIONS

Plate 10. Creative design course by Richard E. Bailey, chairman, art department, Central High School, Providence, R. I.

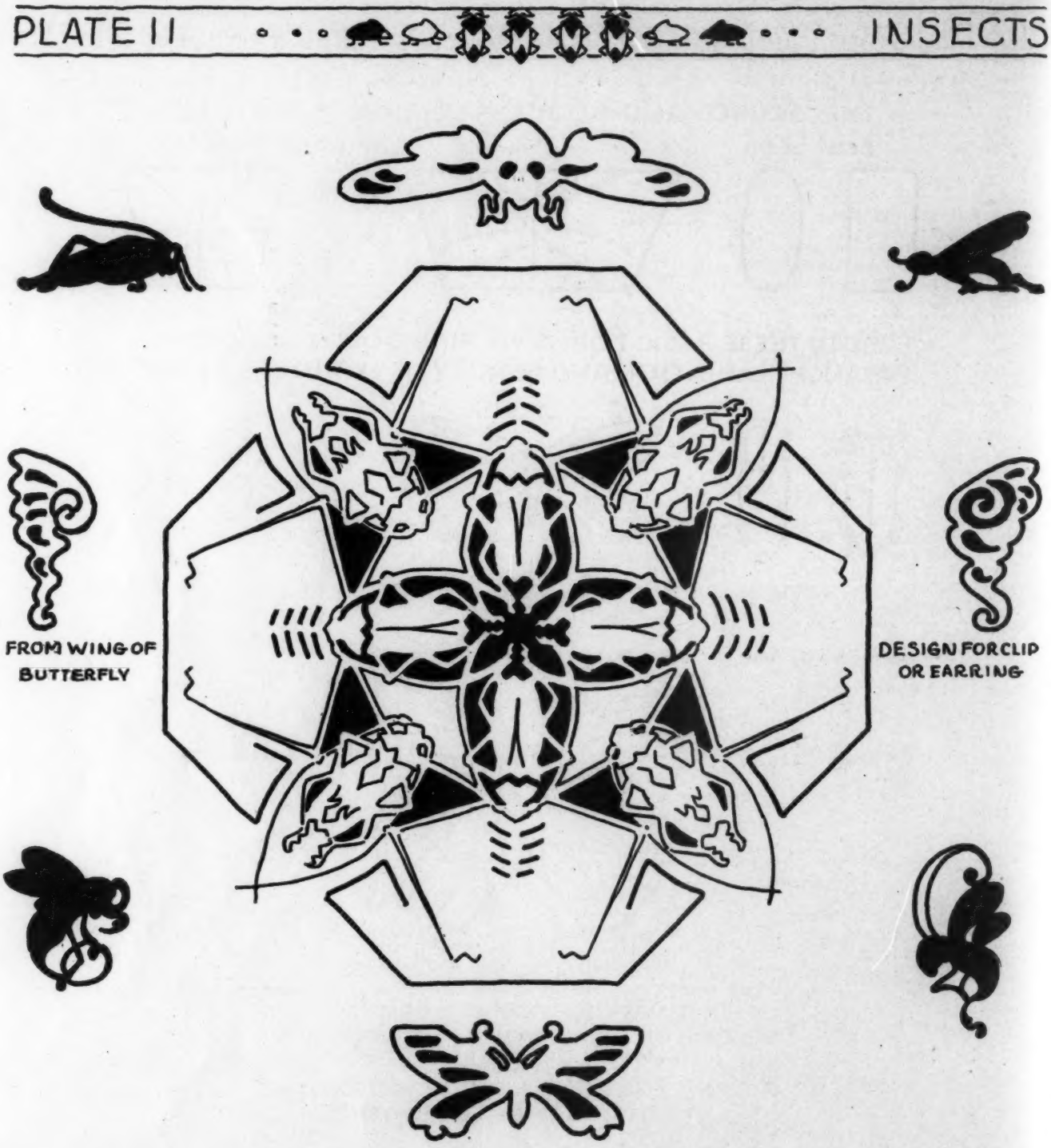


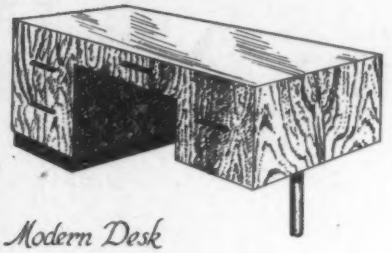
Plate 11. Continuation of creative design course by Richard E. Bailey, chairman, art department, Central High School, Providence, R. I.

DOES STRUCTURE INFLUENCE DESIGN IN WOOD?

The designer, especially when he is the cabinetmaker, learns to take advantage of the special qualities of grain – texture, color, figure, direction, and feel.

American Walnut Table
Eighteenth Century

Writing Desk – American Wing, Metropolitan Museum of Art

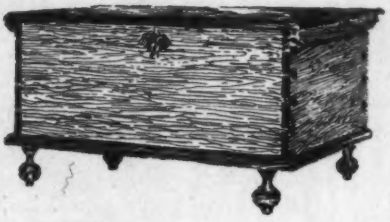


Modern Desk

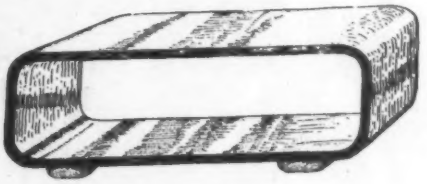
Solid wood expands and contracts across the grain, so provision is made (in overhang of top) for change of size.

When built-up panels are used, edges may fit to exact size, since practically no change of size occurs.

Matched curly maple front



Contrasts in side and end grain show up in visible joints, as decoration.



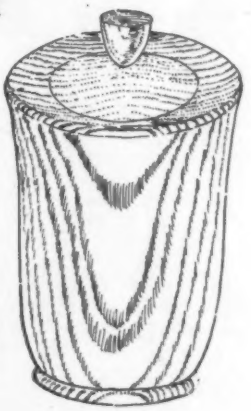
Modern Coffee Table – French

American Walnut Chest

Modern laminated construction, made under tremendous pressure and with waterproof glues, for house walls, airplanes, furniture, etc., makes possible forms and uses beyond the power of the hand-worker, who should not copy them.

Claw-and-Ball Leg

Certain cuts (in this instance turning) bring out interesting grain effects.



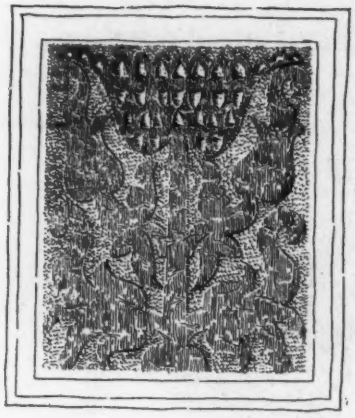
An "engineering" requirement calls for knowledge of grain strength.

Cigarette Box
German

Plate 22. Design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

WHAT METHODS OF CUTTING WOOD ARE AVAILABLE?

Carving



Panel from Sunflower Chest
Flat surface with background lowered

Ship Figurehead
Carved in full relief

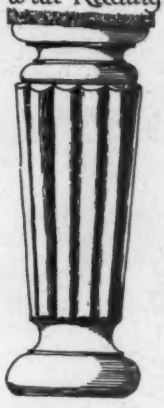
Fifteenth Century Panel
Raised pattern on flat background

Turning

Plain Turning

With Fluting

With Reeding



Spiral Turning

Sawing

Chair Rail - Sawed and Carved
Nutting, "Furniture Treasury"

These methods are used singly and in combination in endless variety of form.

Plate 23. Continuation of design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

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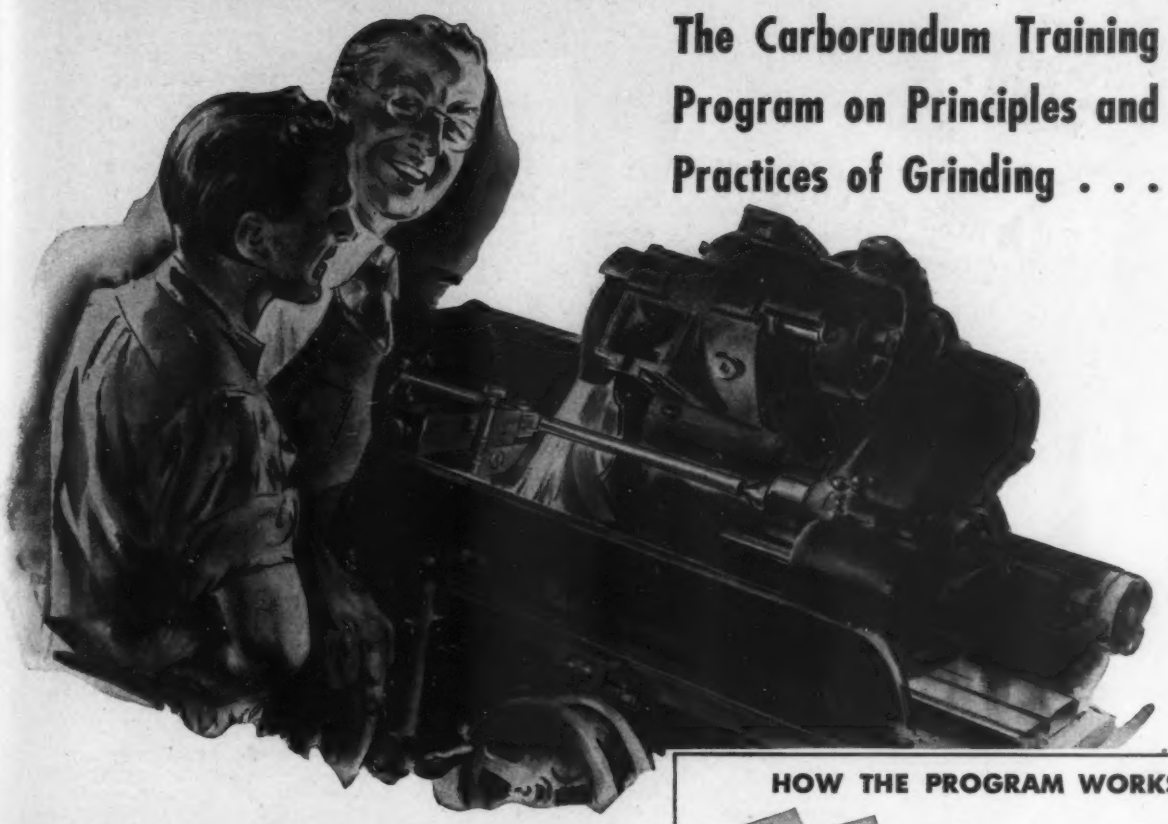
The Carborundum Training Program on Principles and Practices of Grinding . . .



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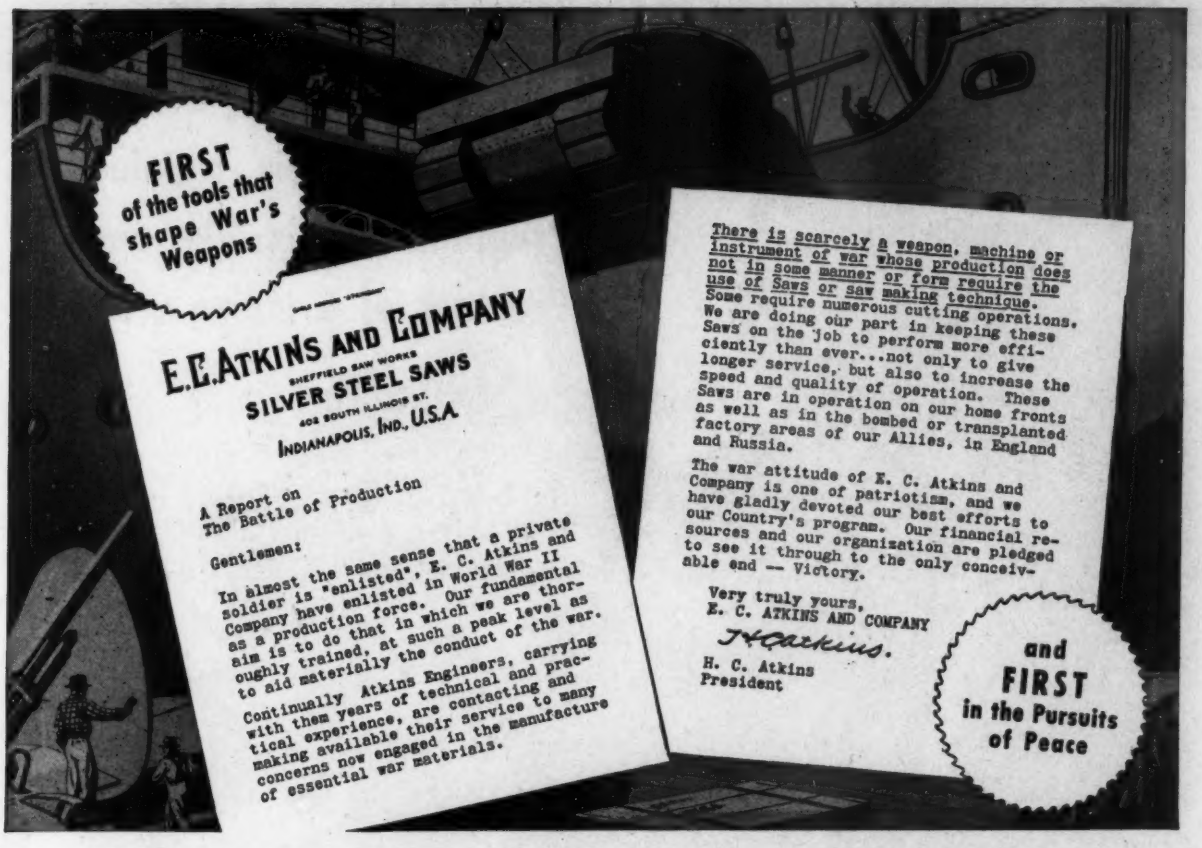
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There is scarcely a weapon, machine or instrument of war whose production does not in some manner or form require the use of Saws or saw making technique. Some require numerous cutting operations. We are doing our part in keeping these Saws on the job to perform more efficiently than ever...not only to give longer service, but also to increase the speed and quality of operation. These Saws are in operation on our home fronts as well as in the bombed or transplanted factory areas of our Allies, in England and Russia.
The war attitude of E. C. Atkins and Company is one of patriotism, and we have gladly devoted our best efforts to our Country's program. Our financial resources and our organization are pledged to see it through to the only conceivable end — Victory.
Very truly yours,
E. C. ATKINS AND COMPANY
H. C. Atkins
President
and
FIRST
in the Pursuits
of Peace

Personal News

♦ Lt. Col. Verne C. Fryklund has been advanced to the position of Chief of Civilian Training, Army Air Forces, and is located in the office of the Assistant Chief of Staff, Personnel, Army Air Forces, in Washington, D. C.

Colonel Fryklund recently has been the military representative in the Preinduction Training Branch of the War Department. Those who followed his work while at Fort Knox in teacher training will be interested in knowing of this advancement, and of the greater service which he can now render to vocational education in the war effort.

♦ Earl L. Bedell, head, department of industrial education, Wayne University, and director of vocational education, Detroit Public Schools, Detroit, Mich., was promoted to the position of divisional director in charge of technical and vocational schools and vocational education.

♦ Dr. F. Theodore Struck of Pennsylvania State College, State College, Pa., taught two intensive courses dealing with vocational teacher-training relating to war production at the University of Louisiana during the last two weeks in May and the first two weeks in June. This service was arranged through the cooperation of Dr. C. L. Mondart, director of vocational education, L. S. U., and Dr. Andrew Triche, state supervisor of industrial education, and state director of vocational training for war-production workers, Louisiana. Following this training program, Dr. Struck participated in the intersession and the main summer session at the Pennsylvania State College.

♦ Prof. John F. Friese, who has been on leave of absence from his position as Associate Professor of Industrial Education at the Pennsylvania State College, State College, Pa., has returned and has taught there throughout the summer semester. Pennsylvania State College is now operating on a three-semester basis in order to use its facilities as fully as possible to further the war effort.

♦ Harry W. Paine, University of Cincinnati, received the Ed. D. degree on May 29, at the regular 99th Commencement Exercises of the University of Michigan at Ann Arbor, Mich.

♦ Charles W. Sylvester, director of vocational education, Baltimore, Md., one of the guest instructors at the Pennsylvania State College, State College, Pa., summer session, addressed a joint meeting of the Iota Lambda Sigma Fraternity and the Pennsylvania State Industrial Education Club at Pennsylvania State College on Thursday, July 15. Mr. Sylvester chose as his topic for this occasion, "War and Post-War Problems in Vocational Education."

♦ Deyo B. Fox has resigned his position as supervisor of War-Production Worker Training with the State Board of Control for Vocational Education to accept a new position as director of vocational education and guidance with the Jackson, Mich., board of education.

♦ C. E. Highlen, co-ordinator of apprentice training at Muskegon, Mich., and formerly supervisor of War-Production Worker Training for the State Board of Control for Vocational Education, entered the service as a Senior Lieutenant, United States Navy, April 14.

♦ Dr. Paul T. Rankin, who has been with the Detroit public schools system 22 years, was named to the newly created position of assistant superintendent in charge of research, educational planning, and informational service, by the board of education at its annual meeting in June. He was formerly supervising director of the research and information service and associate director of the Wayne University graduate school.

He will handle special assignments, under Herman J. Browe, deputy superintendent. Rankin came to Detroit in 1921 as instructor at Detroit Teachers' College and as assistant supervisor of research. A graduate of Michigan State Normal College he received his M.A. and Ph.D. from the University of Michigan.

♦ Wayne University, Detroit, Mich., conferred the master's degree in industrial education on the following men on June 17, 1943: James Arthur Buck, William D. Cox, Robert E. Hawkins, Theodore W. Hoover, William R. Jumer, Joseph P. Kojesky, Marvin Allen Maten, Thomas O. Monroe, Emil C. Nelson, H. Charles Radabaugh, M. D. Rand, H. Edwin Rowley, Walter Engle Thome, and Frank M. Updegraff.

♦ Arthur Martin, who formerly was co-ordinator of apprentice training in Dowagiac, Mich., has been engaged as full-time director of vocational education for Benton Harbor. Mr. Martin returns to Michigan from a recent experience in industry in Indiana.

♦ J. W. Giachino, formerly an instructor in both Hamtramck, Mich., and W.M.C.E., is now a lieutenant in the Navy and officer-in-charge of aviation metalsmith in all of the Navy training schools.

♦ Sven Eklund has resigned his position as co-ordinator of occupational training at Ann Arbor, Mich., to become manager of a laundry at Ishpeming, Mich.

♦ Edward Bailey, formerly co-ordinator at Big Rapids, Mich., has been appointed co-ordinator of occupational training at Ann Arbor, Mich.

♦ G. B. Westerberg, formerly an instructor at the Junior High School, Dundalk, Md., has changed his position to McDonogh School for Boys, McDonogh, Md. In his new capacity, Mr. Westerberg will be teacher of industrial arts and

(Continued on page 22A)

EVEN THE GENERAL CHANGES HIS HAT

In time of action the leader must lay aside his trim hat, strip off his gold braid and sleek attire. He looks different—but his ability and character remain the same!... PLUMB, too, dons a "service uniform". Because of Government Limitations the appearance of some Plumb Tools has been changed. But the "hidden qualities" remain the same. Plumb Tools have the same hang and balance, design and temper that won them a quality reputation for nearly ninety years. While the fine finish has gone for the duration you will recognize Plumb design and balance by the ease and speed with which it works.... Plumb is proud of its service uniform! Fayette R. Plumb, Inc., Dept. I-3, 4837 James Street, Philadelphia 37, Penna.

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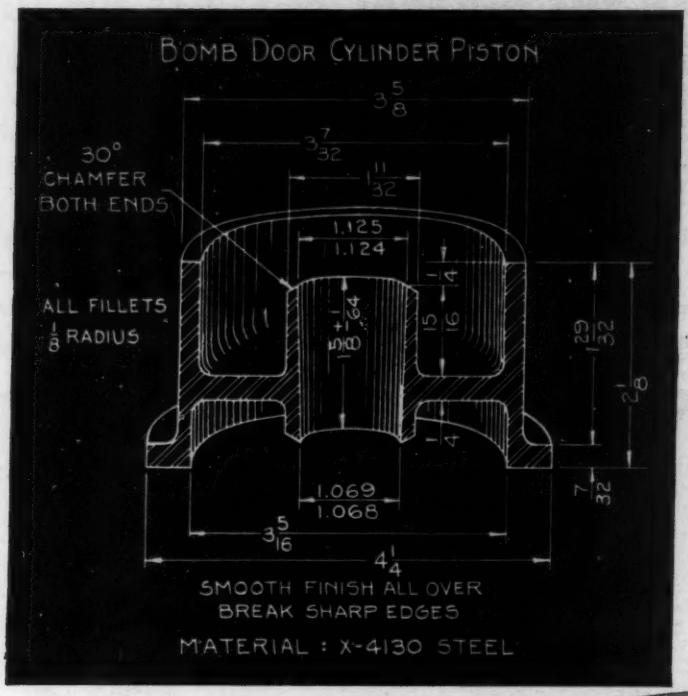

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(Continued from page 20A)

integration teacher of handwork in the lower school. McDonogh is a military school for boys.

♦ A. W. GILL, formerly at the University of North Dakota, is now in charge of engineering drawing at the University of Arizona, Tucson.

♦ DR. HORACE MONTGOMERY and MR. EDWARD CUBBON, instructors in the State Teachers College, California, Pa., have received commissions as lieutenants in the U. S. Navy.

♦ DR. ANDREW TRICHE, state supervisor of trade and industrial education for Louisiana, has been given a life membership in the American Vocational Association. Dr. Triche, a native of Baton Rouge, La., is a graduate of the State University and holds a doctor's degree given by the University of Pittsburgh.

Association News

INDIANA INDUSTRIAL EDUCATION CONVENTION

The twelfth annual convention of the Indiana Industrial Education Association was held in the Claypool Hotel, Indianapolis, on May 7 and 8, 1943. As a prelude to the convention, a one-day meeting was held on May 6 for the supervisors and directors of War-Production Training for Indiana.

At the luncheon meeting on Friday, May 7, an address was given by Mr. Fred Murphy, state director of guidance. Mr. Murphy discussed the place of guidance in the present war emergency. The meeting was conducted by Mr. Dennis H. Price, vice-president of the Indiana Industrial Education Association.

The general session in the afternoon consisted of an address by Dr. Virgil W. Nestrick, department of education, Queen's College, New York, whose subject was, "Arts for the Elementary Grades." Mr. Allman, president of Indiana State Teachers Association and superintendent of the Muncie Public Schools, served as chairman. Presiding officer was Mr. Fred J. Schmidt, president of I.I.E.A.

The address at the annual banquet was given by Mr. James E. Gheen, New York, on the subject, "What Do You Know." On Saturday morning, May 8, an after-breakfast meeting, sponsored by the chapters of Epsilon Pi Tau and Iota Lambda Sigma in Indiana, presented Lt. Colonel Verne C. Fryklund, Services of Supply, War Department, Washington, D. C. His remarks were concerned with the preinduction training program. Lt. Colonel Fryklund appeared in the second general meeting later in the morning. We were also pleased to hear an address by Dr. Harry Good, Ohio University, on the subject, "Education Through Work."

The Saturday noon luncheon was presided over by Mr. Dennis Price. An address was given by Mr. Glenn L. Eckley, supervisor of training, Farnsworth Radio, Marion and Fort Wayne, Ind. His subject was "Women in Industry." The Ship's program was presided over by Mr. Charles Roper of McKnight & McKnight Publishers, Bloomington, Ill. Twenty participating exhibitors helped to make the convention a success.

At the annual business meeting, the following officers for 1943–44 were elected: president, Dennis H. Price, Indiana State Teachers College, Terre Haute, Ind.; vice-president, Glen Barkes, University School, Bloomington, Ind.; secretary-treasurer, H. G. McComb, War-Production Training Division, Indianapolis, Ind.

♦ The Brooklyn Guild Teachers of Shopwork of New York elected the following officers for the school year 1943–44: president, John M. Hurley; vice-president, Stanley Weber; corresponding secretary, Louis R. Krassner; recording secretary, Abe Beckman; financial secretary, William P. Davis; and treasurer, Philip Weisbard.

Representatives elected to the Council of the Associated Guilds of Teachers of Shopwork of New York City are: John M. Hurley, president; Charles G. Fischer, director of shopwork, New York City; Stacey Maney, assistant director of shopwork, New York City; and William Weitz, legislative representative.

The Brooklyn Guild meets on the second Thursday of every school month at 8 p.m. at Brooklyn Technical High School.

The Council of Associated Guilds meets on the first Monday of every school month at 4 p.m. at Capitol Hotel, New York City. — *Louis R. Krassner.*

♦ The National Graphic Arts Education Association in the second year of the war feels that it has definitely kept graphic arts education in the wartime picture.

A SUMMARY OF EDUCATIONAL ACHIEVEMENTS

For the past 31 years graphic arts education has been a pioneer form of education for industry and has kept pace with American education generally. The following are enumerations of facts: (1) Graphic arts education is widespread. There are but very few areas in this country, where it would be impossible for a student to get printing as part of his regular education. (2) On the junior and senior high school levels printing emphasizes the importance of the industry, the varied uses of the different kinds of printing, the materials and equipment employed, and the opportunity for a career. (3) Vocational schools, strategically located, prepare directly for employment in the industry. (4) The college of printing prepares for the higher executive positions in the plant, the office, and the field, and also as teachers of printing. (5) Teachers of printing — 2500 to 3000 of them in normal times — are the keymen who interpret the values of printing, to those who come under their instruction. (6) The name Printing Education, and later

(Continued on page 24A)

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Accustoms pupils to accurate, creditable work — for industry or avocation

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The war-training program for industry has brought home the importance of adequate equipment and high standards of performance in the school shop. Here is a machine that fits right into this modern conception of vocational education. Its accuracy, power and all-around convenience are almost unbelievable in the light of its low price.

Motor and driving mechanisms completely enclosed. Super-safe guard follows the saw, assuring complete protection at all angles. Dozens of features make this the best saw value on the market.

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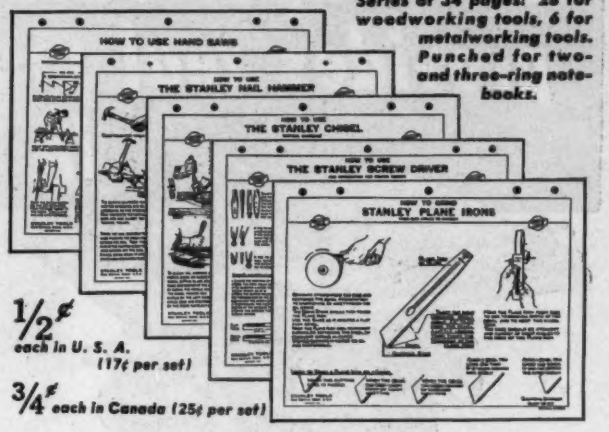

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(Continued from page 22A)

Graphic Arts Education, rather than Apprenticeship Training, were adopted so as not to conflict with the long established apprenticeship systems for which the industry is noted. We hold that real apprenticeship begins when the school graduate goes on the job. (7) Evening training and part-time training are available through the schools for the advancement of those employed in the industry. (8) The results of the school training, from the viewpoint of personnel alone, is evident in the fact that during the past 25 years, until the present wartime experience, there has been no shortage of workers. (9) We have urged, with a considerable degree of success, that teachers keep in touch with industry developments through our conferences on Printing Education, by reading the trade journals, and by active participation in the adult education forums of the International Association of Printing House Craftsmen. (10) The most successful schools of printing are those which have the cooperation of representative advisory committees, consisting of the employer, labor, and education.

The foregoing ten-point factual statement takes on additional meaning when we relate it to the current wartime and postwar planning program as carried on through the school year 1942–43. Here again are high-light facts, stated in summary outline form:

1. *Regional conferences:* Seven conferences were held during the year in various parts of the United States.

2. *Essay and typographical contests:* More than 5000 essays were entered in the Seventh Annual Essay Contest sponsored jointly by our association and the Printing Ink Division of the Interchemical Corporation for high school students in the United States and Canada.

3. *Promoting friendly relations with Latin America:* For the second successive year the Annual Essay Contest conducted in cooperation with IPI was open to students in Latin American schools, as well as to students in schools of North America.

4. *Franklin celebrations:* The celebrations held during the 1943 Printing Education Week were more widespread than ever. They were held in active cooperation with the two leading Franklin Associations in America — The National Franklin Committee of the Franklin Institute and the International Benjamin Franklin Society, Inc. Seventeen Junior Franklin Societies in representative schools of printing were organized.

5. *Working with U. S. Office of Education:* Our association was among the first to recognize the importance of the High School Victory Corps, organized by the U. S. Office of Education in cooperation with the Army and Navy. As a result we were invited by the U. S. Office of Education to participate in a conference made up of representatives of national associations in a number of special fields of education.

We feel that the recognition of the graphic arts as a part of the so-called Communication Arts is a decided step forward in our general program of graphic arts education.

6. *Other government contacts:* Due to the promotion of the various wartime drives by schools of printing — sale of bonds and stamps, salvage drives, victory gardens, etc. — Graphic Arts Education identified itself with the government agencies promoting the chief wartime activities.

7. *Industry activities:* In the field of wartime industry activities, the association is represented on the executive committee of the Graphic Arts Victory Committee, and also took part in the man-power drive planned by the National Printing Equipment Association.

8. *Standardized courses of study:* Progress can be reported in the preparation of basic courses of study in printing for junior high schools, senior high schools, and vocational schools.

9. *Educational publications:* To keep Graphic Arts Education before educational authorities, teachers, industry leaders, the following publications are maintained and distributed widely:

a) Graphic Arts Education in Wartime — a special booklet describing the work of the association during the first year of the war, designed and printed by C. Harold Lauck of Washington and Lee University.

b) Graphic Arts Education — our official magazine, designed and printed by the students of the department of printing, Carnegie Institute of Technology.

c) The News Bulletin, issued monthly during the school year.

d) The Club Crafter, the official organ of our National Student Graphic Arts Society, the student honor division of the association.

It must be clear that such a program as outlined in the two factual statements would have been quite impossible without active cooperation between education and industry.

Printing is one of the very few pioneer industries in industrial education that still retains something better than a mere semblance of cooperation with organized education.

The fact is that if it were not for the National Printing Equipment Association, the United Typothetae of America, The International Printing Ink Division of the Interchemical Association, and a small group of industry sponsors, which have contributed cash and office space and facilities, and the trade journals for their helpful publicity, there would be no National Graphic Arts Education Association today to make real the slogan, "Printing and education are inseparable."

(Continued on page 27A)

The Order of the Day is...ORDER NOW!

In spite of the fact that demand for School equipment and supplies has been unprecedentedly heavy because of Uncle Sam's urging Schools to enlarge their training facilities, we as National School Distributors for America's leading school equipment and supply manufacturers have been able to render a service far beyond wartime expectations.

No effort is being left undone by the entire personnel of Brodhead-Garrett to maintain the cherished prestige of "Headquarters for Equipment and Supplies for the Nations' Schools", and we are naturally anxious to serve *all* schools to the limit of our ability.

Because at present we can, in many cases, ship from a stock that, under the present emergency, is in surprisingly good shape, we suggest you anticipate your needs, and send your order in now.

New 1944 B-G Catalog . . . ready soon

In spite of the difficulties of getting equipment and supplies, the 1944 B-G Catalog is being published as usual. If a copy doesn't reach you shortly, please ask for one.

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WE MUST WIN THE WAR

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Along with other manufacturers we are engaged in fulfilling the important wants of our armed forces. That means, Uncle Sam comes first and he must be provided for to the best of our ability. Unfortunately we cannot service as completely as we should like to the Weidenhoff equipment now used by schools. We realize our obligation to the users of this equipment everywhere and still will do all in our power to help them get the greatest good out of such equipment. For the duration we shall be limited in accomplishing this, but meanwhile, suggest to instructors particularly, to read the following hints for equipment preservation.

All switches of a test bench or other apparatus should be in the OFF position when the equipment is not in use. It provides protection to the meters.

•

Clean corrosion of any kind from switches with fine sand paper or emery cloth. This applies particularly to switches carrying heavy current.

•

Be exceedingly careful of voltmeters, ammeters, etc. If they are damaged or broken replacement of the unit may be impossible.

•

Take exceptionally good care of test leads. Keep them free from oil and grease. Remember oil and grease affect rubber insulation and test leads for replacement purposes are out for the duration. It's a good plan to wash the leads with soap and water, using a sponge or rag.

•

Avoid using a vacuum gauge on an engine that is back firing. The interior mechanism of the gauge may be damaged and replacement of the gauge is doubtful.

•

Don't pull testing equipment around by means of the wire leads attached to it. Also, when a lead is detached grasp it at the terminal.

•

Be careful of cars passing over rubber hose attached to a gas analyzer. You know what the rubber situation is. And, the hose should not be left lying on the floor where it may contact oil and grease.

•

If amperage or voltage is to be checked be sure to select a scale high enough so the meter will not be damaged. Overloading the meter may damage the unit and it is doubtful if a new meter can be obtained.

•

Moisture of any kind is harmful to electrical testing equipment. Therefore, at regular intervals wipe off any trace of moisture and keep the equipment in a dry place.

•

Test bench motors should be lubricated in accordance with the instructions furnished. This point is easily forgotten since these motors are used intermittently. Keep the motors clean and never allow the brushes to become worn so that the brush holders might damage the commutator.

•

If dry cells are used in the equipment remove them when they are "dead". Such exhausted cells become corroded and may cause corrosion of adjacent units.

•

If you have a growler don't leave it turned on after removing the armature on test. The growler will overheat and may burn out.

•

Finally, remember that your testing equipment will have to do for the duration. Therefore, conserve it in every way possible.

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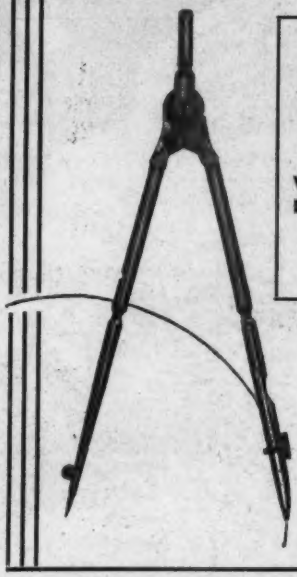

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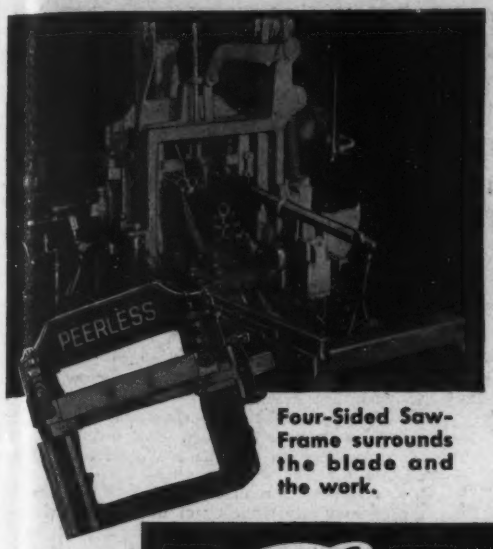

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Detroit Public Library

(Continued from page 24A)

The Educational Outlook

Fortunately for both industry and education, the National Graphic Arts Education Association has had the able leadership for the past two years of President Hupp E. Otto, assistant principal and printing instructor at the McKinley Trade School, Wheeling, W. Va., a man of broad experience as a teacher, administrator, and trade leader. His fellow officers, Michael J. Eck, principal, Edison Occupational School, Cleveland, Ohio, vice-president; Ceylon S. Romig, instructor, Senior High School, Altoona, Pa., secretary; Vincent C. Coyne, instructor, Middlesex County Vocational School, New Brunswick, N. J., treasurer; the regional vice-presidents; and the chairmen of standing committees — are all men of mature experience and sound judgment. The same, of course, goes for the board of directors, made up of men engaged in industry and in education, most of whom are pioneer leaders in Graphic Arts Education. All these men, quite appropriately, have been "frozen" in their association jobs for the duration. — *Fred J. Hartman,* Educational Director.

♦ The Michigan Industrial Education Society held its annual convention at Lansing, Mich., on May 14 and 15, 1943.

All of the convention programs held closely to the main convention theme, "In Combat or Postwar — Industrial Education an Increasing Need of the Nation."

The first general session, at which George F. De Puy, president of the Michigan Industrial Education Society, presided, was held at 2 p.m. Friday. This meeting was followed by an interesting "Town Hall" round table under the leadership of Earl Bedell, director, industrial education, Detroit, Mich. The problem discussed was "Teaching Methods and Teaching Aids," and many comments were contributed from the floor.

At the banquet held Friday evening President George F. De Puy presided, and Dr. J. W. Sexton, superintendent of public schools, Lansing, Mich., was toastmaster.

On this occasion honorary life memberships to the association were conferred on Lt. C. E. Highlen and George Fern for outstanding services rendered to the cause of industrial education.

The Reverend Samuel N. Oliver, First Congregational Church, Muskegon, Mich., gave the main address on "Going Further." He admonished his hearers that we must look and go forward, not forgetting the traditions and the principles of the past, that we must again give supreme allegiance to God whom we have forgotten, and that we must be ready and willing to bring sacrifices to attain not only physical but also spiritual sovereignty.

Stephen Vanek, director of vocational training for war-production workers, Dearborn High School, Dearborn, Mich., presided at the administrator's breakfast on Saturday. F. E. Searle, principal, Henry Ford Trade School, Dearborn, Mich., gave an interesting address outlining the value of training both the hand and the mind.

Archie Nevins, supervisor of industrial-arts department, Kalamazoo High School, Kalamazoo, Mich., presided at the industrial-arts division on Saturday morning.

At this meeting Lt. Col. Verne C. Fryklund, Pre-Induction Training Section, War Department, Washington, D. C., spoke on "Pre-military Training of Youth"; and Lt. Comm. Charles C. Caveny, U.S.N.R., educational officer, Great Lakes Naval Station, Navy Pier, Chicago, Ill., spoke on "Implications of Navy Mechanics' Training in Postwar Industrial Education."

Dr. Downing, who spoke for labor, emphasized that the present war was one of skills, and that hence teacher trainers, and teachers of skills were much in demand; that we must abandon old ideas and prejudices, that we must make the utmost use of every available source of skilled man power, overlooking race prejudices so that democracy can function as it should.

At the business meeting, Lewis H. Hodges, of Grand Haven, Mich., was elected as president, and Andrew Althouse, Detroit, as vice-president for the coming year.

Sectional meetings on auto and aeromechanics, trades and industries, drafting, printing, and visual education were held on Saturday morning. Lewis H. Hodges presided at the Ship's luncheon, and C. W. Otto, secretary, Lansing Chamber of Commerce, was toastmaster.

Dr. J. Raymond Schutz, North Manchester, Ind., spoke on "Industrial Education for the Present Conflict and for Post War America," and outlined the stupendous problems which confront our country, and which must be solved if America is to preserve its way of life.

The distribution of the Ship's prizes then followed.

"The question is not so much which subjects shall be saved or what advances shall be made; the question is whether the ideal of continuous adjustment to the facts of enrollment can be maintained, whether the fruits of philosophic thinking and experimentation can be gained, whether the fitting of people to environment must be discontinued." There should be an advance, not a retreat, as to the new subjects for they contribute strongly to the development of youth and to the general welfare. "Their (the school administrators') stand must be positive rather than protective. They must uphold not the right to keep a given offering but the right to change and to change again in fairness to those served by the schools."

— *Homer J. Smith*

Answers to Questions

PENETRATING OILS AND CLEANSING SOLUTIONS

1100. Q.: I should like to get information on the following:

1. Of what ingredients are penetrating oils compounded?
2. What is the composition of the liquid used to free rusty nuts on bolts?
3. What is the best gum solvent to clean fine watches and clocks where highly refined oils have been used?
4. What is the best approved method of cleaning a typewriter?
5. Are there any books dealing with the cleaning and repair of watches? — *C. D.*

A.: 1. Penetrating oils may be made up of kerosene, 20 parts by weight; light mineral oil, 70 parts by weight; Butyl alcohol, 10 parts by weight. For many purposes the kerosene and mineral oil mixture alone will be sufficient.

2. Rusty nuts and bolts may be loosened by first giving them a good application of the penetrating oil. Allow this to penetrate into the joints and then give the bolt or the nut a few blows with the hammer. Usually this will be effective.

3. The gum solvent for cleaning fine watches and clocks is made up by boiling ⅛ bar of ivory soap in a quart of water until it is entirely dissolved. After it has cooled, add ½ pt. of household ammonia and 1 tbsp. of baking soda. This solution will form a jelly and should be heated before it is used for cleansing purposes. The parts must then be rinsed in clean water, after which they are dipped in alcohol and then dried in boxwood sawdust.

4. The home cleaning of a typewriter where the typewriter is not taken entirely apart may be done as follows:

a) Take out the rubber platen and remove ink and other dirt with alcohol and a cloth. If necessary the platen may be sanded lightly in a lathe to remove the hard outer surface. This will roughen it up a trifle and present a new soft surface for the paper.

b) Clean the type by brushing with an old toothbrush dipped in alcohol.

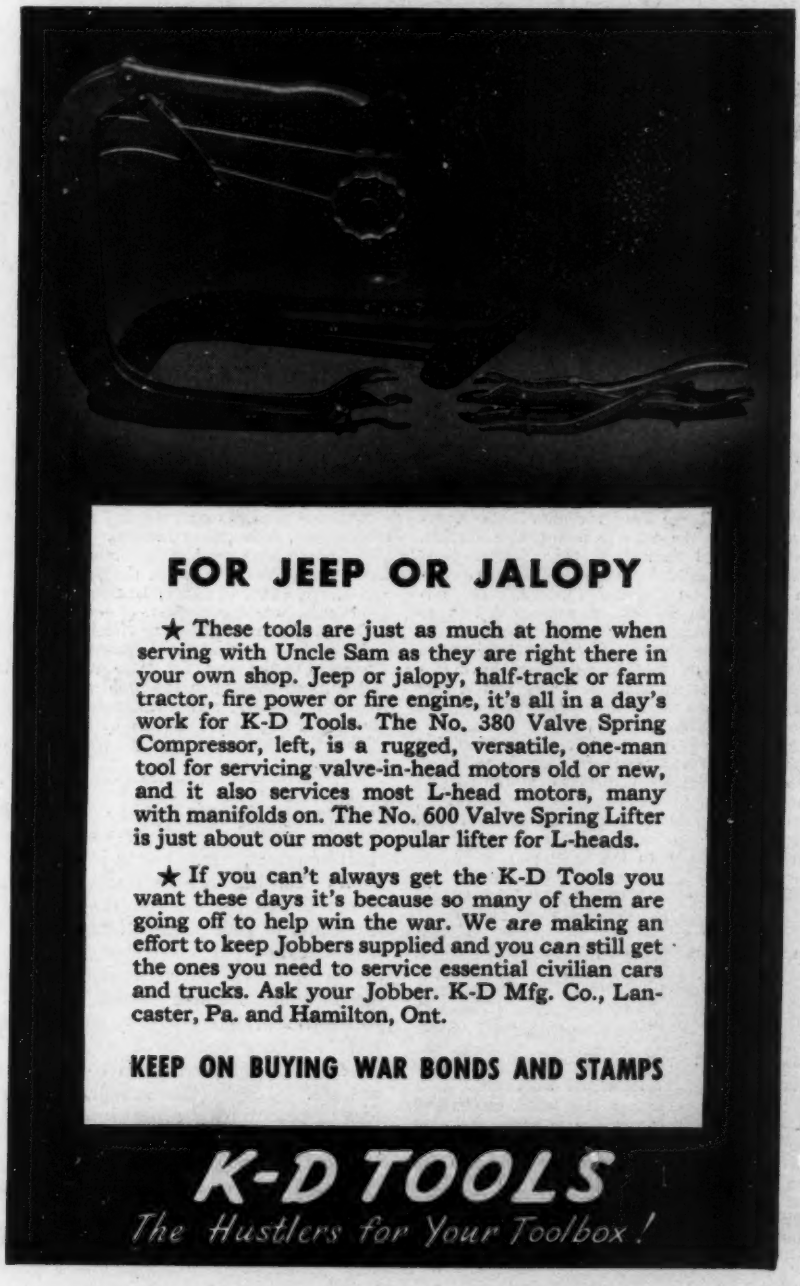
c) Remove the carriage. Set the typewriter in a shallow pan and with a narrow paint brush, cleanse all parts that can be reached with a solution consisting of 70 parts of kerosene and 30 parts of light mineral oil. Be careful not to get this oil beneath the finger tabs so as not to discolor them.

Then, dry all the parts as much as possible with lintless rags, using a very thin screw driver to reach the parts.

Finish by polishing the enameled frame with a little auto polishing wax. Run several pieces of paper through the machine before using it again for typing.

5. There are a number of books dealing with the cleaning and repairing of watches and clocks to be obtained, but most of them treat only of special phases of watch and clock repair, and will not help the learner very much. For anyone interested the Wisconsin Institute of Horology, 524 E. Mason St., Milwaukee, Wis., offers a correspondence course in watch and clock repairing.

The Milwaukee Vocational School offers a course in watch repair for those who can attend personally. This school is accredited by the National Horological Association. — *Ed. C. Schattschneider.*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★ These tools are just as much at home when serving with Uncle Sam as they are right there in your own shop. Jeep or jalopy, half-track or farm tractor, fire power or fire engine, it's all in a day's work for K-D Tools. The No. 380 Valve Spring Compressor, left, is a rugged, versatile, one-man tool for servicing valve-in-head motors old or new, and it also services most L-head motors, many with manifolds on. The No. 600 Valve Spring Lifter is just about our most popular lifter for L-heads.
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News Notes

♦ Among the visiting staff, or those who taught, lectured, or participated in panel discussions in connection with the summer sessions at the Pennsylvania State College, State College, Pa., were Dr. L. H. Dennis, executive secretary of the American Vocational Association; John J. McCarthy, state director of vocational education, New Jersey; Charles W. Sylvester, director of vocational education, Baltimore; John J. Seidel, executive assistant, U. S. Office of Education; Mr. Ed. Berman, assistant superintendent of schools and director of vocational education, Bayonne, N. J.; and Prof. G. Harold Silvius, associate professor of industrial education, Wayne University, Detroit, Mich.

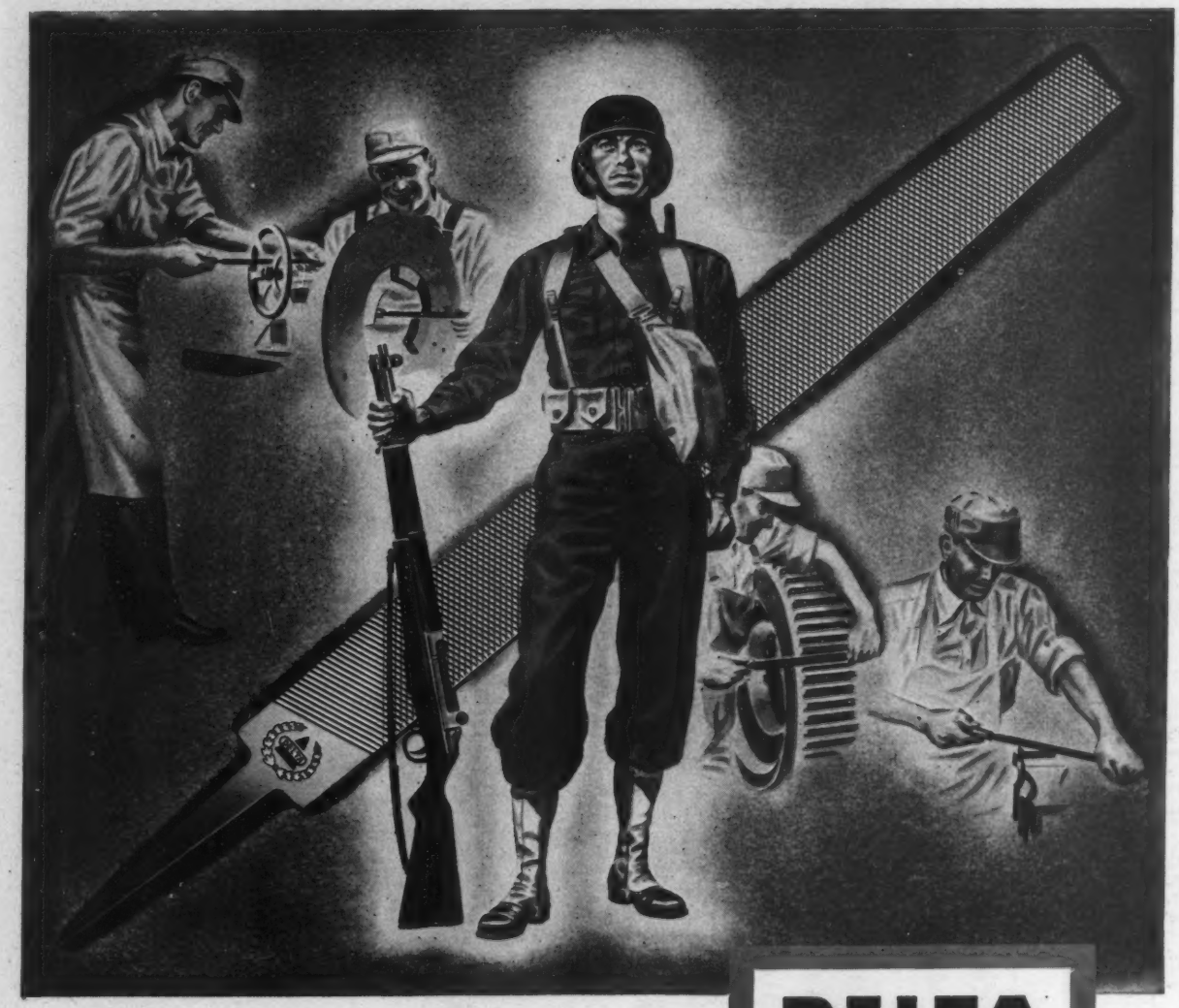
One of the outstanding features of the summer session was the course in "Emerging Problems in Vocational Education," taught by Dr. L. H. Dennis. In addition to teaching the course, Dr. Dennis also served in advisory and consultant capacities. Dr. Dennis was formerly state director of vocational education in Pennsylvania, former president of the Pennsylvania Vocational Association, and also of the National Association of State Directors of Vocational Education. Currently, he is serving in advisory capacity for many important committees at Washington. His outstanding service as executive secretary of the American Vocational Association is recognized everywhere. He is an alumnus of the Pennsylvania State College.

♦ Through the cooperation of the Williamsport, Pa., board of education, the State Department of Public Instruction, and the Pennsylvania State College, State College, Pa., a number of professional improvement courses for teachers in service were offered during the year at the Williamsport Technical Institute. A course for conference leader trainers was also conducted at the same place.

♦ An extensive teacher-training program has been under way for some time at the Pennsyl-

(Continued on page 30A)

This FIGHTING FILE can free One Man in Five



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BIG WORDS, these. But it's a fact—proved by actual scientific tests—*that Delta Files will do on the average 25% more work in the same amount of time, with the same effort.* Delta cuts clean. Bites deep. Eats away the hard part—hungry for tough metal. Each tiny fang snaps up its full share at every stroke.

Today, more than ever before, the future of the nation's production is in the hands of vocational instructors. You know what machines deliver the most work—the processes that get work done faster—the shortcuts to finishing the job in less time. In brief, you know how to get *full capacity*. That's why it's important that you know about Delta—the fighting file—that can free one man in five.

MAKE THIS TEST: Clamp a bar (say 1 inch square), upright in a vice. Cut a hole in a sheet of paper to fit over the bar. Take 50 or 100 strokes with a Delta, each side, and collect the filings. Do the same with your present file. Now, weigh the filings. The difference is likely to surprise you.

(Continued from page 28A)

vania State School of Aeronautics, Harrisburg, Pa. Several hundred teachers were trained during the year, and the units of instruction related to aircraft maintenance and repair. The teacher training was under the joint auspices of the State Department of Public Instruction, the State School of Aeronautics, and the Pennsylvania State College. Mr. Robert T. Stoner is principal of the Pennsylvania State School of Aeronautics.

♦ More and more critical positions in the government service are being vacated by men drawn into the armed services. To qualify, persons are desired who have had executive experience (involving analysis) in business or industry as distributors or manufacturers of such commodities as foods, textiles, metals, consumer goods, or industrial equipment. Specialization in sales management, factory management, procurement, market analysis, traffic management, or expediting of production, is desirable.

The positions pay from $2,433 to $7,128; however, few appointments will be made to positions paying $5,228 and over. There are no age limits for this examination and no written tests.

Further information and application forms may be obtained at first- and second-class post offices, Civil Service Regional Offices, and the Commission in Washington, D. C.

♦ To have available photostat and blueprint operators to replace those being inducted into armed services, the United States Civil Service Commission is accepting applications for federal employment from persons with appropriate experience or training. Women are being placed.

Positions are in Washington, D. C., only and pay $1,752 a year, including overtime pay for the present 48-hour week. At least 3 months' experience or 80 hours' training in photostat or blueprint work are required. Those receiving training in such work may apply and receive provisional appointments prior to completion of the course.

There are no age limits. No written test is required. Full information and application form 60 are available at first- and second-class post offices, Civil Service regional offices, or the Commission in Washington, D. C. Applications should be sent to the Commission's Washington office.

♦ Journeymen, helpers, and laborers in the various branches of the shipbuilding field are needed immediately for work at Pearl Harbor, Puget Sound Navy Yard, Mare Island Navy Yard, and Hunter's Point Dry Docks.

The U. S. Civil Service Commission and the War Manpower Commission have issued circulars inviting persons interested to make application. Positions are available for all adults, and nurseries and schools are provided for the children of workers.

Application may be made to the U. S. Employment Service Office, or to the local secretary in any post office or regional director.

♦ The National Bureau of Standards of the U. S. Department of Commerce has issued new standards for school tables for use by producers, distributors, and school officials.

The new simplified practice recommendation covers the dimensions and heights of various kinds of tables used in schools.

1. Individual pupil table: One size, 18 by 24 in., four heights.
2. Two-pupil table: One size, 20 by 48 in., four heights.
3. General purpose and library tables: Two sizes, 30 by 72 in. and 36 by 72 in.
4. Lunchroom and project tables: One size, 30 by 72 in., four heights.
5. Bookkeeping table: One size, 22 by 32 in. in the 29-in. height.
6. Typewriter table: One size, 18 by 30 in. in the 27-in. height only, or adjustable in height.
7. Table and chair heights: Height to top of table, all tables, 20 to 29 in.; typewriter tables, 27 in.

Height to top of chair seat, all tables, 11 to 17 in.; typewriter tables, 17 in.

Height from chair seat to table top, all tables, 9 to 12 in.; typewriter tables, 10 in.

Minimum knee space, all tables 4½ to 6 in.; typewriter tables, 6 in.

♦ The Carboloy Company, Detroit, Mich., has issued a statement, showing that 40,000 men and women in industry have been trained in the design, grinding, and brazing of carbide tools during the past five months through the use of silent slide training films.

It is reported that a total of 17,000 persons have been trained in the first five months that the films were available. The films were produced in Detroit last fall in an effort to relieve the shortage of carbide trained personnel in industry. All of the films are noncommercial in character and are designed primarily to provide a better understanding of the characteristics of cemented carbides.

Other films deal with design, brazing, application, and grinding of carbide tools. The production costs were absorbed by the Carboloy Company and the films were offered to industry at approximate reprint costs.

♦ The Rehabilitation Service Center, at Teachers College, Columbia University, New York City, has been established for the training of rehabilitation workers. It will seek to provide the personnel to rehabilitate men and women in industry, and especially the war veterans. The center aims to train many thousands of workers who are needed for this important service. Mr. Terry Foster, research director of the Vocational Rehabilitation Division of the U. S. Office of Education, is in charge of the training courses now being offered.

♦ "How to Get More Light for Your Money," a new wartime lighting booklet which provides

(Continued on page 32A)

Let's Get Together and Plan Together

We need your ideas. We can supply the practical knowledge gained through successful experience in planning and building Laboratory and Vocational Furniture. Working together, your ideas will take shape now — become a reality tomorrow.

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(Continued from page 30A)

housewives with information on the correct use and care of lamps and lighting fixtures, has been prepared by the Westinghouse Lamp division.

Among the subjects covered in the new booklet are: the ABC's of good lighting; how to clean and recondition shades, reflector bowls and lamp bases; how to select shades that give more light; how to replace broken plugs; how to change a fuse; and selecting proper size bulbs and reflector bowls for replacement.

Priced at two cents each, the booklets may be secured through any Westinghouse Lamp Division sales office, or by sending a two-cent stamp to the Illuminating Engineering Department, Westinghouse Lamp Division, Bloomfield, N. J.

This firm has also issued interesting and elucidating statements in the form of short five to eight-page writeups on "Electronics in Industry," "Electronic Conversion of Power," and "Typical Industrial Electronic Applications," which will be fine additions to the reference shelves of the shop in which electricity is taught on the industrial arts and vocational education levels.

♦ The B. F. Goodrich Company, Akron, Ohio, has recently published a booklet entitled "Crisis in Rubber." It is not offered as a scientific discussion on the chemical structure of rubber, but it does review the status of natural and synthetic rubber and what has been accomplished to meet the most crucial situation that has ever confronted our nation.

♦ A new electrode comparison chart, prepared by the Air Reduction Company, is intended to simplify the buying of competitive welding electrodes. It details the principal electrode classifications and indicates which electrodes meet the different requirements.

The user of this chart is able to determine what brands of electrodes fall within a specified category, as well as to learn what alternate brands may be used successfully where a specified one is not available.

Copies of the chart may be obtained by writing to Mr. G. Van Alstyne, Air Reduction, 60 East 42nd St., New York, N. Y.

♦ Industrial Rayon Corporation's curiosity and interest in the evolution of continuous processes, by which textiles have progressed from a handcraft to one of the most mechanized of all industries, has led the company to the publication of a book entitled "Continuous Process and Its Contribution to Textile Progress." It contains an authentic, illustrated chronicle of the major technological advances which have made textile history.

While the volume has been published in a limited edition for private distribution, it will be generally available in major textile and industrial centers throughout the country at the public libraries, industrial museums, universities, colleges, and textile schools.

For further information write to Mr. Paul L. Einstein of the Hill and Knowlton Company, Guildhall Building, Cleveland, Ohio.

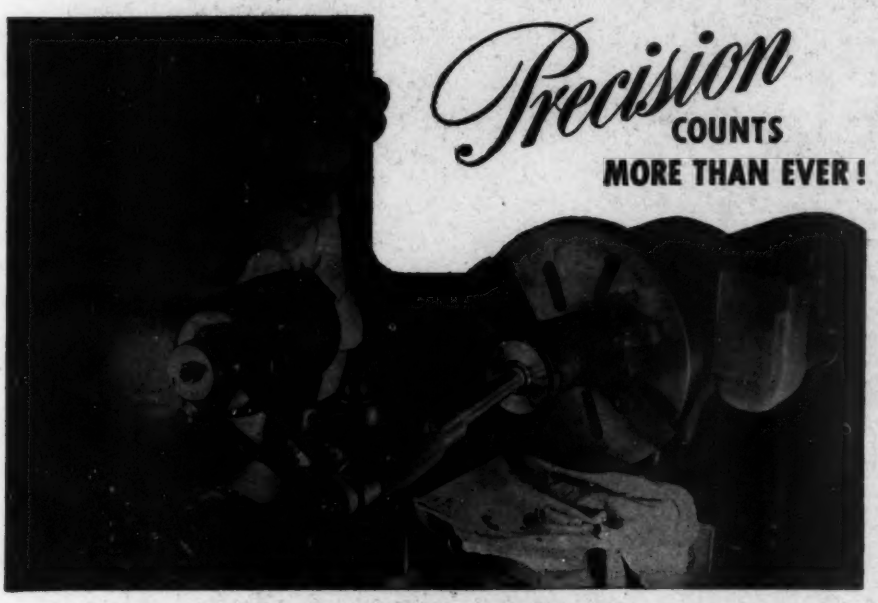
♦ The Craftint Mfg. Company, Cleveland, Ohio, has perfected a Craftint Doubletone drawing paper which has been found successful in preparing three-dimensional perspective drawings. The Craftint drawings speed up production, save time, and eliminate waste. Craftint shaded drawings enable the worker to visualize, in finished form, the actual appearance of the job he is doing.

Craftint Doubletone which is used for direct contract printing is transparent enough so that when the drawing is completed, it can be used to make blueprints, or Ozalid prints.

♦ A new sound film presenting basic first-aid information in graphic form has just been released by the Bureau of Mines, Department of the Interior, Dr. R. R. Sayers, director of the bureau, announced today.

Produced in cooperation with a large industrial firm, the film entitled "Help Wanted," is in 16mm. sound and runs 31 minutes. Copies are now available for exhibition by industrial and civil defense training classes, training courses conducted by or on behalf of the Army, Navy, and Maritime Service, and by schools, churches, colleges, civic and business organizations, and other similar groups.

Application for free loan of "Help Wanted" should be addressed to the Graphic Services Section, Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa., and should state specifically that the borrower has a sound projector. Although no charge is made for use of the film, the exhibitor is expected to pay transportation charges both ways and for loss or damage other than normal wear.



Precision COUNTS MORE THAN EVER!

WAR WORK EXPANDS GRINDING OPERATIONS

A cardinal requirement of manufacturing for war is dimensional precision; and the conversion of a huge portion of America's industry to war production has necessitated a rapid expansion of grinding facilities. Thousands of plants have avoided heavy expense and critical delay by mounting Dumore Precision Grinders on various available machine bases, for intermittent or continuous operation. Thus, innumerable new workers have made their first acquaintance with precision grinding through using a Dumore. They have gained a valuable experience in producing precision work, and in operating and caring for a tool which embodies advanced design and highest quality workmanship. The Dumore is a precision instrument, yet simple to set up and operate. Seven sizes and fifty-four quill combinations give the widest range of application. The catalog gives full details of sizes and capacities. The Dumore Company, Grinder Division, Racine, Wisconsin.

Write for this!

Dumore PRECISION GRINDERS

DUMORE PRECISION GRINDERS ARE SOLD BY AUTHORIZED INDUSTRIAL DISTRIBUTORS IN PRINCIPAL CITIES

New Publications

School-Shop Administration

By Arthur B. Mays and Carl H. Casberg. Cloth, 218 pages, 5¾ by 7⅞ in. Price, $2.50. The Bruce Publishing Co., Milwaukee, Wis.

A book written by men of vast experience on the principles and practices of school-shop administration. It will be found helpful by shop teachers, as well as by students in training.

The book is divided into 16 chapters which deal with the problems of school-shop administration, the planning of such shops, the selection, purchasing, and installation of equipment, maintenance, purchase and storage of supplies, records and inventories, safety administration, routing of projects, class organization, discipline,

(Continued on page 37A)

INDUSTRY WELCOMES STUDENTS TRAINED WITH SKILSAW TOOLS!

• America's busiest war plants prefer SKILSAW TOOLS . . . so they prefer new workers trained with SKILSAW TOOLS. They know students reach peak production *sooner* when taught with the tools and methods of industry itself.

SKILSAW TOOLS are lighter, more compact, more powerful. That's why they're such favorites in aircraft, tank and war plants everywhere. Ask your dealer for a convincing demonstration of SKILSAW TOOLS *today!*

SEND FOR THIS FREE CATALOG!
It illustrates every tool in the SKILSAW *line. Then ask your dealer to demonstrate these tools on the jobs you teach.*

SKILSAW DRILLS (Above) speed up every drilling job in every material. Light, compact, powerful for easy handling, fast production. 23 MODELS

SKILSAW BELT SANDERS (Below) do all sanding and "final-finishing" easier, better, 10 times faster. Light, perfectly balanced. 4 MODELS

SKILSAW DISC SANDERS (Left) for all grinding, filing, sanding and polishing of wood, metals, compositions. 6 MODELS

SKILSAW INC., 5035A Elston, Ave., Chicago, Ill.
New York • Boston • Buffalo • Philadelphia • Cleveland • Detroit
Indianapolis • St. Louis • Kansas City • Atlanta • New Orleans
Dallas • Los Angeles • Oakland • Portland • Seattle • Toronto

Shop Equipment News

New Products — Publications

A NEW PENCIL-TRACING CLOTH

The Frederick Post Company of Chicago has just recently developed a new greatly improved white pencil tracing cloth called *Whitex*.

One of the new outstanding features of Whitex is that it is moisture resistant on both sides. Draftsmen know the importance of this feature to guard against spots from perspiration or moist hands, and against climatic conditions.

Hard pencils make jet-black lines on the new fine-tooth surface of Whitex. This feature plus the glasslike transparency of Whitex assures prints that have a uniform background and sharp, white detail.

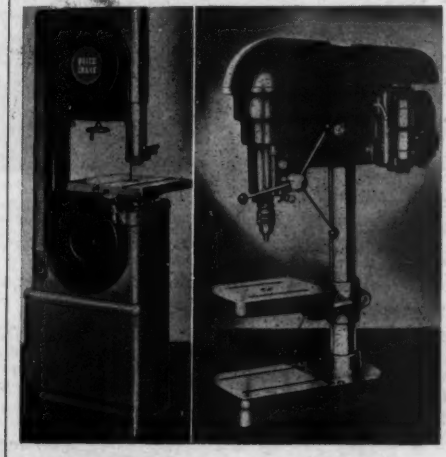
Samples of this new white pencil tracing cloth can be secured by writing to The Frederick Post Co., Box 803, Chicago, Ill.

For brief reference use IAVE—710.

MODERN BAND SAW, DRILL PRESS, AND TAPPING MACHINE

A new band saw for cutting metals, wood, plastic and paper has been introduced by Boice-Crane Co., 932 Central Ave., Toledo, Ohio. It cuts stock 8⅝ in. thick and handles work 27 in. in diameter. An accurate blade tension scale has been provided.

The entire framework is a single one-piece steel structure, and operation is quiet and vibrationless. The wheel guard swings on hinges and must be closed before the machine can be operated.



Modern band saw and drill press

A telescoping guard holds by friction when the lock handle is released. It will not drop while adjusting.

Blades from ⅛ to ¾ in. may be used and are adjusted by a convenient single knob control.

The 15 by 15½-in. table is rigidly supported on large trunnions and no portion can sag under heavy cuts. It tilts 45 deg. to the right and 10 deg. to the left, the degree of tilt being indicated by a convenient scale.

Eight speeds to suit blade and material are provided.

Heavy duty gears transmit as much as one horsepower at lowest speed with a wide margin of safety. All gears run in oil.

On floor models all mechanisms are fully enclosed and sealed against dust and grime. There are no exposed moving parts. The saw has been given top rating by State Safety Commissions. It is also available in bench models.

The Helmet Head drill press shown is one now being made by this firm. They are available in one-, two-, three-, or four-spindle types; high and slow speed; bench or floor types; slotted or trough table.

A feature of these drill presses is the new self-centering 30-deg. pressure angle, 6-tooth involute spline. The spindle, quill, and spindle-pulley are held in permanent, perfect, alignment.

Boice-Crane Tapping Machines, designed for the Boice-Crane Helmet Head operate at 3000 r.p.m. *in;* and 6000 r.p.m. *out*. Taps enter every hole centrally without slightest strain. Two sizes are offered.

For brief reference use IAVE—711.

CARVOCAST

Carvocast offers a new material to those who want to do hand carving. The ease with which this material may be cut makes it an ideal carving medium for grade, high, and vocational schools. Carvocast also takes color and finishing liquids readily, and has been found adaptable for carving in every way.

Carvocast can be obtained by writing to American Crayon Co., Sandusky, Ohio.

For brief reference use IAVE—712.

TEACHING AID FOR EXPLAINING CENTERLESS GRINDERS

Realizing the need of vocational schools for more elementary information on centerless grinding, the Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio, has prepared a booklet which contains a series of six pictures of the wood model used in their own apprentice school to explain how the centerless works. This model has proved very successful in dispelling the mystery of centerless grinding which always is present in the mind of the average student. The pictures represent the major high lights of the demonstration, while the text is essentially the same as the lecture delivered by the instructor.

For brief reference use IAVE—713.

HOW TO USE A FILE

This 28-page booklet issued by the Delta File Works, Inc., Philadelphia, Pa., presents a brief course on the proper selection, use, and care of files. The book is beautifully illustrated, and the explanatory matter is brief and to the point.

Numerous half tones show how and how not to use a file.

For brief reference use IAVE—714.

HAND STONED CUTTING TOOLS

This well-illustrated booklet shows what a real cutting edge is; why tools with incorrect edges break down; how refined (oilstoned) edges cut faster, better, and hold up for a longer time.

The book cites reports of astonishing increases in production from oilstoned tools, and illustrates some of the most popular shapes of stones available in both electric furnace and natural minerals.

For a copy of this book write to Behr-Manning Corp., Troy, N. Y.

For brief reference use IAVE—715.

RADIO DATA HANDBOOK

Allied's Radio Data Handbook, edited by Lieut. Nelson M. Cooke, United States Navy, U. S. Naval Research Laboratory, Washington, D. C. Forty-eight pages, 6 by 9 in. Price, 25 cents postpaid. Published by Allied Radio Corp., Chicago, Ill.

A comprehensive, condensed handbook of formulas, charts, and data most commonly used in the field of radio and electronics. All subjects are clearly presented and conveniently arranged and cross-indexed for ready reference.

The book is divided into four parts: mathematical data, radio and electronic formulas, engineering and servicing information, and a complete set of four-place log and trig tables.

Formulas are given for decibels, resistance, capacitance, inductance, reactance, resonance, frequency, "Q" factor, impedance, conductance, susceptance, admittance, transients, peak average and R.M.S. voltage and current values, meter shunts and multipliers, vacuum tube consonants, etc.

Data section contains such subjects as radio color codes, interchangeable tubes, pilot lamps, plug-in, ballast resistors, coil winding, and the like.

For brief reference use IAVE—716.

FILM ON GAUGE BLOCKS

Four new 35mm. sound slide films describing the use of gauge blocks are now available. Presentation of the four requires over an hour and a half. They cover the following: theory of gauge blocks; how gauge blocks are used; how gauge blocks are made; and the use of gauge instruments.

The entire history of how gauge blocks came into being is graphically shown by a complete portrayal of the evolution of our modern system of measurement. The discovery of the constancy and uniformity of light waves, which finally gave man a permanent basis on which to base the formerly arbitrary units of length, is presented in a clear and understandable manner.

The four 35mm. sound slide films are offered for presentation before plant executives, foremen, inspectors, and trade school classes by the Savage Tool Company of Minneapolis, Minn.

The films will be loaned for free showing or can be purchased at cost for permanent use. They are available through local Doall sales offices or directly from the Savage Tool Company, upon request written on company or school letterhead.

For brief reference use IAVE—717.

NEW SOUTH BEND CATALOGS

This announces two new catalogs, No. 901, covering the Series 900 and Series 1000 South Bend turret lathes, and No. 14-C, containing full information on South Bend 14½-in. precision lathes.

Both of these catalogs have 8½ by 11-in. pages. The one describes and illustrates all of the lathes available in both series. They are designed for the high speed machining of small chucking and bar work requiring close tolerances. The Series 900 and Series 1000 turret lathes respectively have 9¼-in. and 10⅛-in. swings over the beds and saddle wings and ½-in. and 1-in. maximum collet capacities. The standard equipment for these lathes includes hand-lever turret, hand-lever cross slide, compound cross slide, universal carriage, quick change gearbox, and coolant equipment. All specifications, dimensions, capacities, speeds, and feeds are tabulated in the catalog for easy reference.

The other catalog illustrates and describes South Bend 14½-in. toolroom lathes and engine lathes.

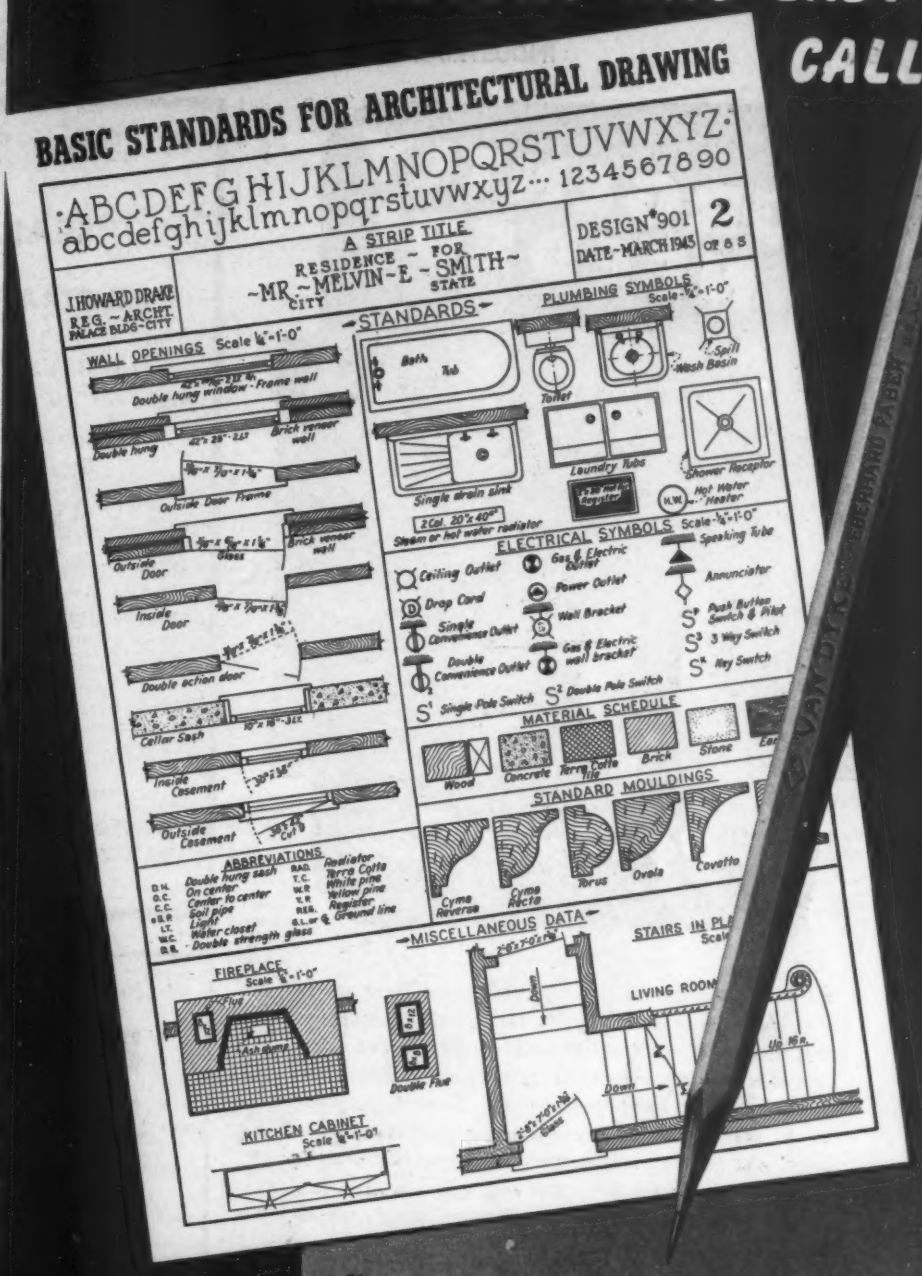
These lathes have a 14⅝-in. swing over the bed and saddle wings, ¾-in. collet capacity, 1⅛-in. spindle bore, and are made in several bed lengths that provide between-centers capacities of 24½ to 84½ in. The fully enclosed underneath motor drive provides eight spindle speeds ranging from 27 to 800 r.p.m. A full page of tabulated specifications gives essential information on capacities, feeds, speeds, and dimensions.

For a copy of either of these catalogs, write to the South Bend Lathe Works, South Bend, Ind.

For brief reference use IAVE—718.

(Continued on page 37A)

SECOND AND LAST CALL!



For Fall Classes!

If you were not among the hundreds who have previously asked for a FREE copy of this Classroom Wall Chart (16½ x 26½ ins.) there is still time. The supply is not unlimited; for this reason a quick response on your part may prevent disappointment . . . There is no cost—nor implied obligation. If we can help you develop drafting skill at this time of the Nation's need, good purposes will be served! If it serves also to keep our name and MICROTOMIC VAN DYKE pencils in the forefront of your interest, so much the better. CLIP THE COUPON AT ONCE!

EBERHARD FABER

LEADERSHIP IN FINE WRITING MATERIALS SINCE 1849

EBERHARD FABER PENCIL CO., Educational Dept., 37 Greenpoint Ave., Brooklyn 22, N.Y.

Please send me, WITHOUT CHARGE, a copy of your chart "Basic Standards in Architectural Drawing."

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Address_____ City_____

Detroit Public Library

URGENTLY NEEDED!

. . . By Uncle Sam

Although we are still producing Quality Woodworking Machinery for war, the fulfillment of wartime requirements will find Crescent ready to serve vocational educational demands immediately. There has been no conversion at Crescent. The demand for woodworking machinery behind fighting lines and in vital war plants continues to be urgent. Crescent's greatest contribution to the war effort was — and still is — to produce more and more quality woodworking machinery.

Increased facilities plus the engineering knowledge that have been acquired in this emergency will enable Crescent to serve school needs better. Anticipate your requirements now. Crescent is prepared to aid you. Descriptive literature is available on a complete line of quality woodworking machinery.

Write for it today.

Crescent
MACHINE COMPANY
LEETONIA OHIO

Save Time and Money
by Using
"SEALACELL PROCESS"
of
PENETRATING WOOD FINISHES
for
FURNITURE — CABINETS — WOODWORK
Resistant to Alcohol, Cosmetics and Hot Dishes.

An Outstanding Quality Finish for Student Project Finishing in School Shops.

NO BRUSHES REQUIRED 1c **NO RUBBING BETWEEN COATS**

Apply With a Cloth — Dustproof on Application. No Special Finishing Room Required. All Sanding Done On Raw Wood.

SEALACELL Never Raises the Grain of the Wood. Can Be Mixed With Ground in Oil Colors for Staining.

Why not send for a "trial order" consisting of one gallon of Sealacell "W", 1 quart of Varnowax and one quart of G. F. Finish, delivered to you for $5.45, shipped on a "Money Back" guarantee basis (if these materials do not prove satisfactory to you, when used according to our specifications).

Send For Folder "Facts." A Post Card Will Bring It.

GENERAL FINISHES SALES AND SERVICE CO.
1548 WEST BRUCE STREET MILWAUKEE 4, WISCONSIN
— We Sell Keene's Cement! —

A Pre-Induction Course for YOUR School

BASIC RADIO CODE KIT

No skill an American boy can have on his induction into the Army is more needed than a basic knowledge of Morse Code. The Army considers this knowledge a number one priority. *Your* school can now provide the necessary training.

The *Basic Radio Code Kit* contains *everything* you need to inaugurate this course with a class of 50 students. It consists of a) 17 double-faced records in albums, b) a Teacher's Manual, c) 50 Printing Charts, and d) 25 pads of Practice Sheets. Completely self-teaching, this kit will enable any teacher to bring an average class up to a receiving speed of 10 words per minute in approximately 80 hours of practice time. No knowledge of the code or radio work in general is necessary.

Based on materials developed by the Infantry School, Fort Benning, Ga., and by the Chief Signal Officer, U. S. Signal Corps, Washington, D. C., the kit is distributed by five leading publishers and priced at $35.00.

SILVER BURDETT COMPANY
New York Chicago San Francisco

(Continued from page 35A)

NEW TEMPLATE BOOK FOR PIPE FITTINGS

"Pipe Templates for Welded Fittings," is the name of a new 12-page booklet which tells how to fabricate fittings for welded piping installations by means of flame cutting and welding. It is published by the Air Reduction Co., 60 East 42nd St., New York City. It explains how to draw up and use paper templates for flame-cutting pipe to assure accurate, close-fitting connections, for such occasions where it is more advantageous for a user to fabricate his own fittings. Free copies of the booklet are available for those who write for them.

For brief reference use IAVE—719.

TRAINING-FILM CIRCULAR

Information about the two apprentice-training films, "The Metal Working Lathe," and "Plain Turning," is now obtainable in a four-color circular, No. 8-A. The films are supplied on a free loan basis to war plants and school shops for training lathe operators.

The 16mm. sound films, in full color, are based upon the book, "How to Run a Lathe." They show what a lathe is for, how it operates, the principal lathe operations, and the application of these operations on a representative job.

Write South Bend Lathe Works, South Bend, Ind., for your copy.

For brief reference use IAVE—720.

BELL-HOWELL FILMSOUND LIBRARY

An increasing number of school-made and teacher-made educational films have become available in straight commercial distribution, according to the Bell & Howell Company, 1801 Larchmont Ave., Chicago, Ill.

Films reflecting school projects are Spinning Spokes, Linoleum-Block Cutting, Essentials of Wood Turning, Pottery Making, and others.

Along the line of educational and professional film production are Caucasian Barrier, Ancient Trails in North Africa, and Warriors of the Sahara.

ARMY-NAVY AWARDS

According to recent war department announcements, Army and Navy "E" awards have been conferred on The Carborundum Co., Niagara Falls, N. Y.; The Wiremold Co., West Hartford, Conn.; and Skilsaw, Inc., Chicago, Ill.

PUBLICATIONS

(Continued from page 32A)

selection and upgrading of teachers, administration of evening school shops, and interdepartmental and public relations.

Introductory Shopwork

By Mack M. Jones. Cloth, 290 pages, 6⅛ by 9⅛ in., illustrated. Price, $2. The McGraw-Hill Book Co., New York, N. Y.

A book describing the use and care of hand and machine tools used in wood and metalworking. It also covers painting and finishing, pipework, soldering and sheet-metal work, wiring and wire splicing and ropework.

Elements of Shop Drawing

By George A. Willoughby and Matt Lappinen. Paper, 39 pages, 6⅛ by 9¼ in., illustrated. Price, 36 cents. The Bruce Publishing Co., Milwaukee, Wis.

An illustrated reference dictionary for the student of drafting and blueprint reading.

It shows by graphic example the different lines and views used on drawings, how dimensions and notes are placed, and how the various symbols and conventions are used by the draftsman.

Examples also show how the different types of holes are shown, finishes indicated, bolts and screw heads and nuts drawn, and how rivets and welds are specified.

Fundamentals of Electricity

Prepared by the Staff of the American Technical Society.

Paper, spiral bound, 106 pages, 8⅜ by 10⅞ in. Price, $2.

Fundamentals of Machines

Paper, spiral bound, 83 pages, 8⅜ by 10⅞ in. Price, $2. American Technical Society, Chicago, Il.

Both of these books are preinduction training workbooks built up on the six-step plan of instruction, i.e., lecture or informational material for study, assignment, quiz, self-test, correction of self-test examination, and a comprehensive examination.

The book on electricity contains 12 lessons which cover magnetism, electron theory, electric circuits, storage batteries, Ohm's law, series and parallel circuits, d.c. meters, a.c. meters, resistance, power, induced currents, d.c. motors and generators.

It also outlines a series of experiments and workshop projects, a number of job sheets, and notes on personal safety.

The book on machines also contains 12 lessons which cover force and motion, motion and pressure, gases and pneumatic appliances, molecules, temperature, and expansion, work and mechanical energy, heat energy and blocks and tackle, automobile construction, automobile engines, engine troubles, aircraft engines, Diesel engines, theory of engines, combustion.

This book also outlines the workshop projects,

(Continued on next page)

Filing Hints to meet war-time needs

HELLER NUCUT USA

GENUINE VIXEN
MILLED CURVED TOOTH FILES

A VIXEN represents a sixth class of files. It differs from (1) Machinists' Files, (2) Saw and Mill Files, (3) Swiss Pattern Files, (4) Rasps and (5) Special Purpose Files in that its teeth are curved. Formed on a milling machine of special design, these teeth have a decided undercut that enables the file to cut faster, clear itself of chips more readily, leave a smooth finish without scratches, and last longer. The table describes the more commonly used shapes.

CROSS SECTION	NAME	SHAPE	CHARACTER OF TEETH	TAPER	GENERAL USES
	Flexible	Rectangular	Milled curved-teeth. Standard, fine, smooth and dead smooth.	Blunt. No tang.	Sheet metal work. Automobile body and fender work.
	Flat	Rectangular	Milled curved-teeth. Standard, fine, smooth and dead smooth.	Blunt.	Sheet steel, iron, aluminum, babbitt, brass, copper, marble, slate, fibre, hard rubber, wood.
	Half-Round Solid	Half-Circular	Milled curved-teeth. Standard, fine, and smooth.	Blunt.	Filing bearings in railroad shops, sugar mills, mines.
	Half-Round Shell	Half-Circular Shell	Milled curved-teeth, on convex face only. Standard, fine, and smooth.	Blunt. No tang.	Fast, smooth filing.
	Moulding	Half-Circular Shell	Milled curved-teeth, on concave face only. Standard, fine, and smooth.	Blunt. No tang.	Mouldings on automobile bodies.
	Square	Square	Milled curved-teeth. Standard, fine, and smooth.	Blunt.	Keyways and other narrow work.
	Pillar	Narrow Width Rectangular	Milled curved-teeth. Standard, fine, smooth and dead smooth.	Blunt.	Finishing wood or metal patterns.
	Flat Babbitt	Rectangular	Milled curved-teeth. Coarser than standard cut.	Blunt.	Filing babbitt, brass, copper.
	Flat Utility	Rectangular	Milled curved-teeth. Standard cut on one face, fine on other face.	Blunt.	Wide variety of automobile, motor boat, and household work.

Like the patented "Wavy Teeth" design of NUCUT Files, the milled curved-tooth construction of a genuine VIXEN is another example of Heller pioneering.

HELLER BROTHERS COMPANY • Newark, N.J. • Newcomerstown, Ohio
America's Oldest File Manufacturers—Good Tools Since 1836

HELLER NUCUT WAVY TEETH FILES

PATENT No. 2027039

(Continued from previous page)

lists needed equipment, and gives the needed personal safety hints.

Six Foolish Drivers

By Arthur W. Schlichenmaier. Cloth, 119 pages, 5⅜ by 7⅞ in. Price, $1.50. The Manual Arts Press, Peoria, Ill.

Six excellent stories which carry their auto driver's safety lessons in an interesting manner. A few paragraphs of explanation and summary accompany each chapter as well as a series of questions which draw the attention of the reader to the salient points contained in the story just read.

250 Teaching Techniques

By Lt. (jg) Edward C. Estabrooke, U.S.N.R., and Lt. R. Randolph Karch, U.S.N.R. Cloth, 131 pages, 5⅛ by 7½ in. Price, $1.25. The Bruce Publishing Co., Milwaukee, Wis.

An interesting and compact collection of statements which tell the shop instructor how he can best take care of the many duties that confront him during his teaching day.

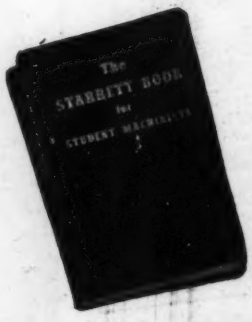
The book is divided into 10 chapters which cover the subject matter as follows: qualities of a good instructor, conducting shop activities, planning and presenting a lesson, conducting a demonstration, the question and discussion period, using motion pictures and film strips, using tests, maintaining discipline, preparing a course of study, and writing instruction sheets.

Measuring Instruments

By C. A. Felker. Paper, 56 pages, 6 by 9 in., illustrated. Price, 52 cents. The Bruce Publishing Co., Milwaukee, Wis.

A concise, yet comprehensive treatment on the use of the steel rule, outside and inside calipers, micrometer, vernier calipers, height and surface gauges, protractor, and thread micrometer.

"My Boys Learned Faster with The STARRETT BOOK for STUDENT MACHINISTS"



"Its text and illustrations are clear and to the point and it is chock full of practical, useful information. The reference tables are handy and helpful for me, too."

ONLY 75c PER COPY

See the STARRETT BOOK at Your Starrett Tool Distributors or Write for Starrett Book Folder "CE".

THE L. S. STARRETT CO., ATHOL, MASSACHUSETTS, U. S. A.

World's Greatest Toolmakers

STARRETT TOOLS

The book is well illustrated and contains numerous assigned problems.

The Binding of Books

By Kenneth F. Perry and Clarence T. Baab. Cloth, 160 pages, 6 by 9 in., illustrated. Price, $2. The Manual Arts Press, Peoria, Ill.

A book for the beginner in school or home shop.

It describes tools and equipment, materials and supplies, and the processes which the beginner must learn in order to bind or repair books for his own use or for the school library.

The book is well illustrated and the directions for doing specific jobs are given in sequential order so that the learner can follow them readily.

Creative Teaching in Art

By Victor D'Amico. Cloth, 261 pages, 7¾ by 10¾ in., illustrated. Price, $2.50. International Textbook Co., Scranton, Pa.

The author of this book presents a practical method of making art an understandable thing to the child.

He leads the child to experiment with materials and processes to produce things of beauty and utility that satisfy not only the longing to produce but also affect personality.

Radio As a Career

By Julius L. Hornung. Cloth, 212 pages, 5¼ by 7¼ in. Price, $1.50. Funk and Wagnalls Co., New York, N. Y.

A man who has had years of experience in the field of radio explains to youth just what opportunities lie before him in the technical and semitechnical branches of an industry that has such unlimited possibilities for the future.

Glue and Gelatin

By Paul L. Smith. Cloth, 192 pages. Price, $3.75. Chemical Publishing Co., Brooklyn, N. Y.

This book deals with all branches of the glue and gelatin industry: raw materials, manufacture, and application.

The book describes the early history, skin and fiber structure of protein, chemistry and proteins, raw material for glue and gelatin, processes, extraction of gelatin from glue stock, filtration, clarification and addition of chemicals, evaporation, recovery and purification of bone fat and skin greases, properties and qualities of glue and gelatin, plastics for gelatin plant construction, glue as an adhesive, and miscellaneous applications. It also explains the use of the photographic industry, foodstuff industry, and other miscellaneous applications.

Fundamental Shop Training

By John T. Shuman, Capt. Bailey Wright, and James Ritchey. Cloth, 327 pages, 5½ by 8½ in., illustrated. Price, $2. Workbook — paper, 73 pages, 8½ by 10¾ in. Published by American Technical Society, Chicago, Ill.

This textbook with its accompanying workbook presents a means of preparing for quick entry into more than twenty army occupations.

The descriptive matter covers the common hand tools; chipping, filing, and scraping; hand threadings; linear measurements; drilling machines, the engine lathe; airplane construction; cable splicing; electric wiring; woodworking; painting and wood preservation; and ropes, splices, and knots.

The workbook divides this subject matter into assignments based on the six-step plan: (1) explanatory lecture; (2) study assignment; (3) the quiz; (4) a written quiz; (5) correction and review; and (6) a comprehensive test.

Suggested Unit Course in Sheet Metal Work

Prepared under the direction of Robert W. Schrott, Ray G. Schueler, Carl A. Witte, and Richard G. Sigafoos.

Put out by the Bureau of Industrial and Technical Education of the New York State Education Department, in cooperation with the U. S. Office of Education, The Federal Security Agency, Washington, D. C.

This series consists of four books, paper bound, 8½ by 11 in., illustrated.

(Continued on page 40A)

FOR INSTRUCTION, TOO... *Industry's Test Instruments* COST LESS . . . BECAUSE OF THEIR LONG-LIFE DEPENDABILITY!

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Ideally suited for classroom instruction and student use because of their dependability, ruggedness and relatively low cost . . . features which have made the Model 430 line so universally preferred throughout industry. Have hand-calibrated mirror scales of long length, with large scale openings. Accuracy within ½ of 1%. Sturdy Bakelite cases give added protection in service. Extremely compact. Available in complete line of A-C and D-C instruments.

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A complete circuit tester for shop or laboratory. Has 27 voltage, current and resistance ranges (d-c voltage sensitivity 20,000 ohms per volt), for checking motor and control circuits, lighting circuits, sensitive relay circuits, communication circuits, etc., etc. Also available with compact resistance tester for checking insulation and cable covering resistance values up to 900 megohms.

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CARTER TOOLS

(Continued from page 38A)

Machine Processes, 86 pages, price, 85 cents.
Hand Processes, 79 pages, price, $1.10.
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Job Sheet Series, 176 pages, price, $1.35.

This series was especially prepared for use in classes in which beginners are trained for entry into the war industries.

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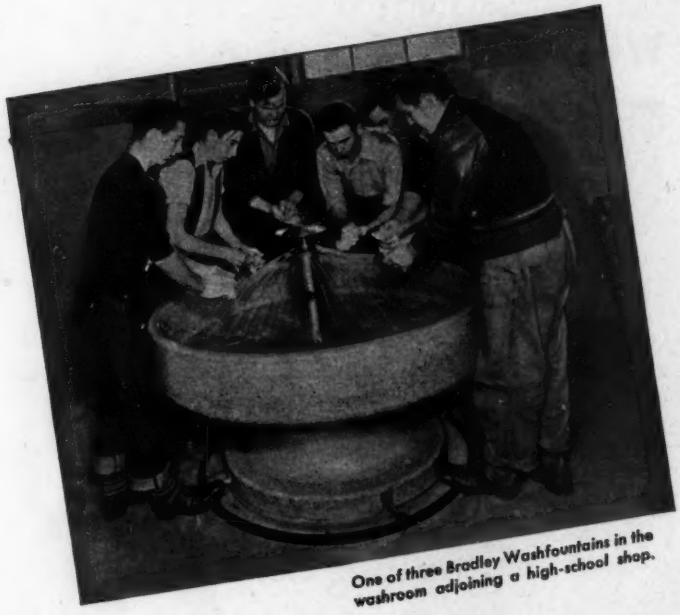
The units are well illustrated by line cuts. A teacher's manual is now in process of preparation.

Manpower Psychology

Compiled by Lee J. Cronbach. Paper, 135 pages. Price, 20 cents. Published by the State College of Washington, Pullman, Wash.

This booklet, just published by the State College of Washington, is intended as a guide in employment psychology. It will be helpful to students in finding source material, and to persons in the field who wish to bring their knowledge up to date. A complete bibliography lists and describes 147 articles, selected from published sources from 1931 to 1943. Such topics as job satisfaction and motivation, grievances, leadership and group morale, personality problems, selection and rating, training, and environmental and physiological influences are treated.



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Shop Students Need These Sanitary Group Wash Fixtures

Clean, sanitary washing fixtures are a necessary part of every school, and modern Bradley Washfountains have replaced the conventional single-person wash basins because they provide the ultimate in sanitation,—save space, require 90 per cent fewer piping connections, and cut water consumption 70 per cent. They serve 8 to 10 simultaneously, with clean running water from a central sprayhead.

Bradleys conserve critical war material—the big bowl and pedestal are of precast stone or marble and as mentioned above they reduce piping connections because one Washfountain replaces 8 to 10 single-person wash basins.

Bradley Washroom Consultants will gladly make washroom layout recommendations. BRADLEY WASHFOUNTAIN CO., 2269 West Michigan Street, Milwaukee 1, Wisconsin.

Catalog 4308 will be mailed on request.

BRADLEY washfountains

Best Books of 1942

By Robert Hoppock and Samuel Spiegler. Paper, 25 cents. Occupational Index, Inc., New York University, N. Y.

Librarians, counselors, deans, teachers, and school administrators will be interested in this helpful guide on occupational information and guidance. The 45 titles are arranged in suggested order of purchase, with 16 free and inexpensive pamphlets listed first.

Basic Electricity

By John L. Feirer and Ralph O. Williams. Cloth, 244 pages, 6 by 9 in., illustrated. Price, $1.92. The Manual Arts Press, Peoria, Ill.

This book has been prepared for high school students of preinduction age about to enter the armed services. It covers the outline recommended by the U. S. Office of Education for such preinduction training.

The book contains chapter summaries, review questions, and special military problems.

Elementary Electricity

By Edgar P. Slack. Cloth, 305 pages, 5¾ by 8¼ in., illustrated. Price, $1.75. Published by McGraw-Hill Book Co., New York, N. Y.

A revised textbook for the beginner. It covers both a.c. and d.c. electricity. New chapters on magnetism and electrostatics have been added to amplify the material in the previous edition. This revision has been planned for use with preinduction courses on the fundamentals of electricity.

Schools and Manpower

Prepared and published by the American Association of School Administrators, Washington, D. C. Cloth, 448 pages, 6¼ by 9⅛ in., illustrated. Price, $2.

This yearbook, planned before December 7, 1941, had to be recast to portray conditions as they exist under the pressure of a war emergency. At the same time the postwar period could not be overlooked either.

The book gives a broad overlook of what the school must do for youth from the time he enters its doors as a mere child, to the time when he is ready to undertake the duties and obligations of adulthood.

Radio Code Manual

By Arthur A. Nilson, Leather, 174 pages, 5¼ by 7½ in., illustrated. Price, $2. Published by McGraw-Hill Book Company, New York, N. Y.

Twenty lessons in radio code. This book, which has been arranged for self-study or for classroom use, prepares the student for sending as well as receiving.

Part I of the book presents the code; Part II initiates the learner in sending; Part III contains the twenty code lessons; Part IV demonstrates how one can learn the code without a partner; Part V shows how to build code practice apparatus; Parts VI, VII, and VIII show how to improve oneself as an operator and how to secure a restricted radiotelephone operator's permit.

Electricity for Everyone

By Joseph R. Lunt and William T. Wyman. Cloth, 649 pages, 6 by 8⅝ in., illustrated. Price, $2.56. Published by The Macmillan Company, New York, N. Y.

A book for the beginning student as well as for the adult who wants to know what activates the electric gadgets which we use almost continually.

There are thirty chapters which cover elementary principles of electricity and magnetism, radio, the electric eye, and television.

The book also contains a glossary of commonly used electrical terms.

American Forests

Prepared and published by American Forest Products Industries, Inc., Washington, D. C. Paper, 44 pages, 6 by 9 in. Free to schools.

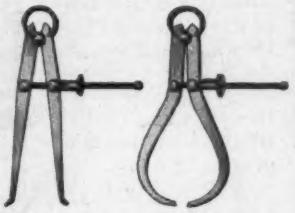
(Continued on page 44A)

KNOW YOUR TOOLS by MILLERS FALLS

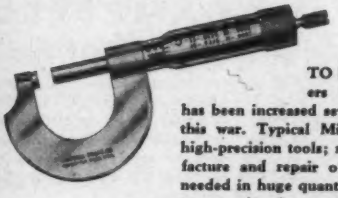
DESIGNED to make accurate depth measurements of holes, slots, shoulders, and projections, the Millers Falls Depth Gauge is a rugged, precise shop tool. Spindle movement one inch, capacity 0 to 3" by .001"; capacity may be increased up to 12 inches with Millers Falls hardened and precision-ground extension rods. Several special features insure accuracy and long wear—standard Millers Falls *extra* quality.

THERE ARE 64 kinds and sizes of Millers Falls calipers and dividers — 3 to 12 inches, inside, outside, and hermaphrodite. All are designed to meet the most exacting requirements of skilled machinists and toolmakers. Made of crucible steel, with rounded edges, hardened, ground, and polished. Many features for accuracy, rigidity and convenience.

Millers Falls' 75 years of toolmaking "know-how" shows in these *quality* tools.



LONG AMONG the most highly-prized items of Goodell-Pratt (now part of Millers Falls Company, whose name now appears on most former Goodell-Pratt tools) has been this Combination Set—blade, beam, protractor, and center head—the most useful precision tool ever made for machinists and toolmakers. Accurate No. 4 graduation; all working faces precision ground; tempered crucible steel blade; complete with level and scriber.



TO MEET constant demand, Millers Falls micrometer production has been increased several hundred per cent during this war. Typical Millers Falls quality, these are high-precision tools; now used largely in the manufacture and repair of war goods, they'll also be needed in huge quantities for production and maintenance in the mechanized world of tomorrow. Plan now to "tool up" with Millers Falls micrometers.

TOUGH MODERATELY PRICED, Millers Falls surface gauges are well-made, well-finished, and unusually versatile. Base is ground for use on flat surface plate and grooved for cylinder. Scriber is spring-held in position as thumb nut is tightened . . . a big help for quick, accurate settings. Spindle can be used as depth or scratch gauge. Many other features for accuracy and convenience demonstrate this tool's background of long skill and experience.

MILLERS FALLS TOOLS SINCE 1868

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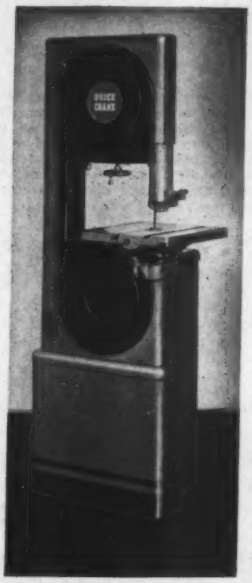

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For cutting metals, wood, plastic and paper. Cuts stock 8¾" thick and handles 27" diameter work. Accurate blade tension scale.

Entire frame work is a single, one-piece steel structure. Wheels made of strong, light weight materials for exceptionally vibrationless and quiet operation. Wheel guards swing on hinges and must be closed before machine can be operated.

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A battery of 6 to 10 Boice-Crane Saws cost no more than some single machines of big size.

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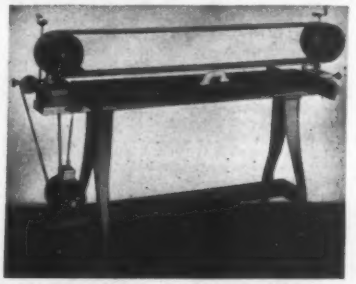

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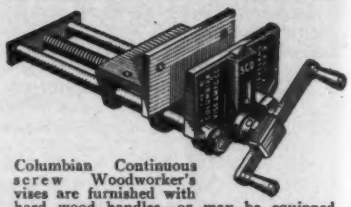
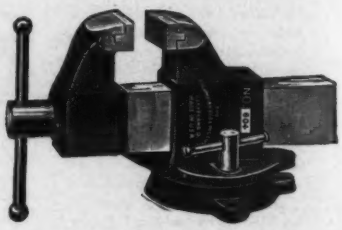


Columbian Continuous screw Woodworker's vises are furnished with hard wood handles—or may be equipped with ADJUSTABLE STEEL HANDLES, as above, to eliminate handle breakage, speed operation and provide extra leverage.



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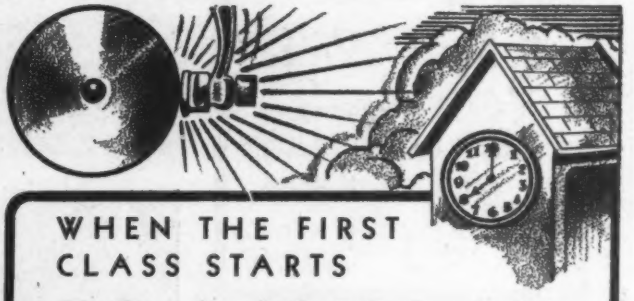

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(Continued from page 40A)

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By Ervin Kenison and James McKinney. Revised by Tom C. Plumridge. Cloth, 330 pages, 5⅞ by 8½ in., illustrated. Price, $2. Published by American Technical Society, Chicago, Ill.

A comprehensive course of mechanical drawing covering lettering, geometrical problems, symbols and conventions, principles of the working drawing, projection, hidden parts, sections, drawing to scale, intersections, developments, isometric projections, and oblique projections.

The book is well illustrated and contains many problems for the student.

Welding and Its Application

By Boniface E. Rossi. Cloth, 343 pages, illustrated. Published by the McGraw-Hill Book Co., New York City.

A book written for the beginner as well as for the journeyman and for the designer and the engineer.

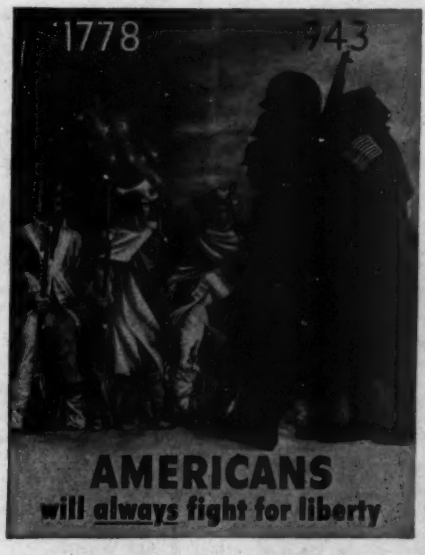
In its 26 chapters it treats of the economy of welding, its applications, meaning of terms, different types of welding processes, arc welding and its techniques, weldability of various metals, stresses set up by welding, welding jigs, metallurgy of welding, testing, cutting of metals, and commonly used welding symbols.

The appendix contains a number of useful tables. The book is well and freely illustrated.

500 Pictures to Draw

By Joseph Francis O'Hare. Cloth, 66 pages, 7 by 10⅛ in., illustrated. Price, $1.50. Published by Bridgman Publishers, Inc., at Pelham, N. Y.

A book for beginners in drawing and picture study. Starting with simple outline figures of birds, butterflies, animals, flowers, fruits, and vegetables, the pupil is taught how to develop control of his pencil, and, as he advances, to plan and portray more difficult compositions.



OWI Poster No. 26. Copies of this poster in colors, 21 by 25 in., may be obtained from the Division of Public Inquiries, Office of War Information, Washington, D. C.

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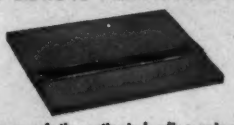

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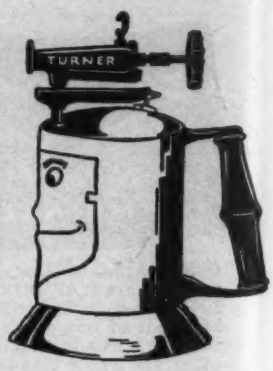

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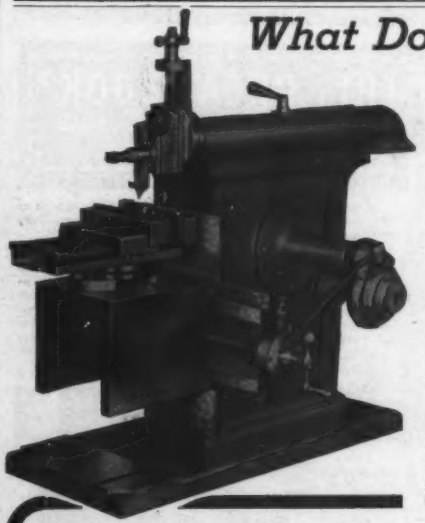

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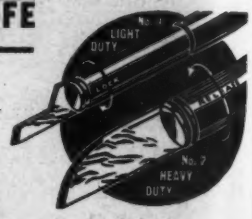

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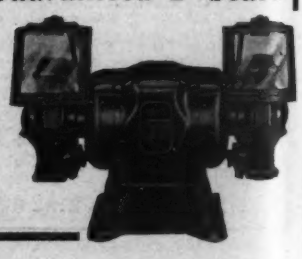

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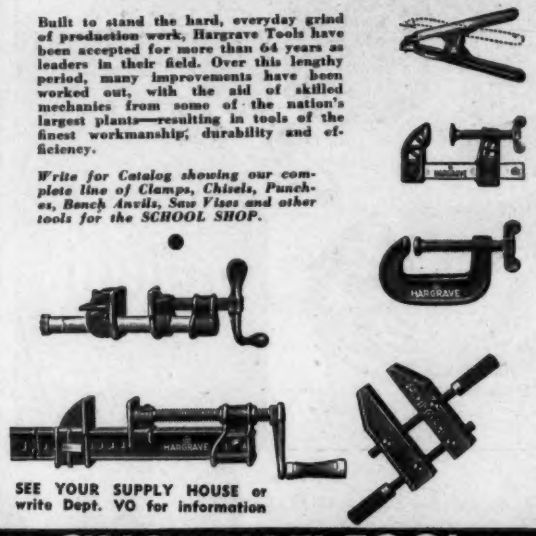

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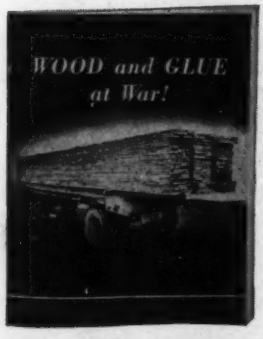

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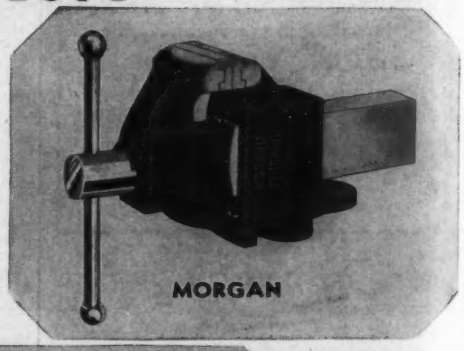

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